

U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS—BULLETIN 184.

A. C. TRUE, Director.

PROCEEDINGS

OF THE

TWENTIETH ANNUAL CONVENTION

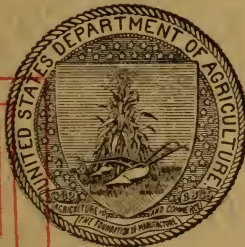
OF THE

ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES
AND EXPERIMENT STATIONS,

HELD AT

BATON ROUGE, LA., NOVEMBER 14-16, 1906.

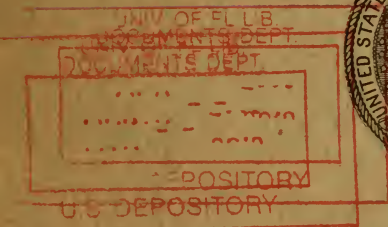
Edited by

A. C. TRUE AND W. H. BEAL,
FOR THE OFFICE OF EXPERIMENT STATIONS,
andH. C. WHITE,
FOR THE EXECUTIVE COMMITTEE OF THE ASSOCIATION.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1907.



THE AGRICULTURAL COLLEGES.

- ALABAMA—*Auburn*: Charles C. Thach.^a
Normal: Wm. H. Councill.^a *Tuskegee*:
 Booker T. Washington.^b
- ARIZONA—*Tucson*: Kendrick C. Babcock.^a
- ARKANSAS—*Fayetteville*: J. N. Tillman.^a
- CALIFORNIA—*Berkeley*: Benjamin Ide
 Wheeler.^a
- COLORADO—*Fort Collins*: Barton O. Ayles-
 worth.^a
- CONNECTICUT—*Storrs*: R. W. Stimson.^a
- DELAWARE—*Newark*: Geo. A. Harter.^a
Dover: W. C. Jason.^a
- FLORIDA—*Lake City*: Andrew Sledd.^a
Tallahassee: Nathan B. Young.^a
- GEORGIA—*Athens*: H. C. White.^a *Savan-
 nah*: R. R. Wright.^a
- IDAHO—*Moscow*: J. A. McLean.^a
- ILLINOIS—*Urbana*: E. J. James.^a
- INDIANA—*Lafayette*: Winthrop Ellsworth
 Stone.^a
- IOWA—*Ames*: Albert Boynton Storms.^a
- KANSAS—*Manhattan*: Ernest R. Nichols.^a
- KENTUCKY—*Lexington*: J. K. Patterson.^a
Frankfort: James S. Hathaway.^a
- LOUISIANA—*Baton Rouge*: Thos. D. Boyd.^a
New Orleans: H. A. Hill.^a
- MAINE—*Orono*: George Emery Fellows.^a
- MARYLAND—*College Park*: R. W. Silves-
 ter.^a *Princess Anne*: Frank Trigg.^b
- MASSACHUSETTS—*Amherst*: K. L. Butter-
 field.^a
- MICHIGAN—*Agricultural College*: J. L.
 Snyder.^a
- MINNESOTA—*St. Anthony Park*, *St. Paul*:
 Cyrus Northrop.^a
- MISSISSIPPI—*Agricultural College*: J. C.
 Hardy.^a *Lorman*: L. J. Rowan.^a
- MISSOURI—*Columbia*: R. H. Jesse.^a *Jeff-
 erson City*: B. F. Allen.^a
- MONTANA—*Bozeman*: Jas. M. Hamilton.^a
- NEBRASKA—*Lincoln*: E. Benjamin An-
 drews.^d
- NEVADA—*Reno*: Joseph E. Stubbs.^a
- NEW HAMPSHIRE—*Durham*: Wm. D.
 Gibbs.^a
- NEW JERSEY—*New Brunswick*: W. H. S.
 Demarest.^a
- NEW MEXICO—*Agricultural College*: Luther
 Foster.^a
- NEW YORK—*Ithaca*: Jacob Gould Schur-
 man.^a
- NORTH CAROLINA—*West Raleigh*: G. T.
 Winston.^a *Greensboro*: James B. Dud-
 ley.^a
- NORTH DAKOTA—*Agricultural College*: J.
 H. Worst.^a
- OHIO—*Columbus*: William Oxley Thomp-
 son.^a
- OKLAHOMA—*Stillwater*: Angelo C. Scott.^a
Langston: Inman E. Page.^a
- OREGON—*Corvallis*: Thos. M. Gatch.^a
- PENNSYLVANIA—*State College*: James A.
 Beaver.^c
- RHODE ISLAND—*Kingston*: Howard Ed-
 wards.^a
- SOUTH CAROLINA—*Clemson College*: P. H.
 Mell.^a *Orangeburg*: Thomas E. Miller.^a
- SOUTH DAKOTA—*Brookings*: R. L. Slagle.^a
- TENNESSEE—*Knoxville*: Brown Ayres.^a
- TEXAS—*College Station*: H. H. Harring-
 ton.^a *Prairieview*: E. L. Blackshear.^b
- UTAH—*Logan*: W. J. Kerr.^a
- VERMONT—*Burlington*: M. H. Buckham.^a
- VIRGINIA—*Blacksburg*: J. M. McBryde.^a
Hampton: H. B. Frissell.^b
- WASHINGTON—*Pullman*: E. A. Bryan.^a
- WEST VIRGINIA—*Morgantown*: D. B. Pur-
 inton.^a *Institute*: J. McHenry Jones.^a
- WISCONSIN—*Madison*: Chas. Richard Van
 Hise.^a
- WYOMING—*Laramie*: Frederick M. Tis-
 del.^a

^a President.

^b Principal.

^c Acting president.

^d Chancellor.

U. S. DEPARTMENT OF AGRICULTURE.

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Edited by

A. C. TRUE AND W. H. BEAL,
FOR THE OFFICE OF EXPERIMENT STATIONS,
andH. C. WHITE,
FOR THE EXECUTIVE COMMITTEE OF THE ASSOCIATION.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1907.

THE OFFICE OF EXPERIMENT STATIONS.

STAFF.

A. C. TRUE, Ph. D.—*Director.*

E. W. ALLEN, Ph. D.—*Assistant Director and Editor of Experiment Station Record.*

W. H. BEAL, B. A., M. E.—*Chief of Editorial Division.*

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., February 23, 1907.

SIR: I have the honor to transmit herewith for publication Bulletin 184 of this Office, containing the proceedings of the twentieth annual convention of the Association of American Agricultural Colleges and Experiment Stations, held at Baton Rouge, La., November 14-16, 1906.

Respectfully,

A. C. TRUE,
Director.

HON. JAMES WILSON,
Secretary of Agriculture.

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OFFICERS AND COMMITTEES OF THE ASSOCIATION.

President.

L. H. BAILEY, of New York.

Vice-Presidents.

T. D. BOYD, of Louisiana;

B. C. BUFFUM, of Wyoming;

M. A. SCOVELL, of Kentucky;

R. W. STIMSON, of Connecticut;

C. G. HOPKINS, of Illinois.

Secretary and Treasurer.

J. L. HILLS, of Vermont.

Bibliographer.

A. C. TRUE, of Washington, D. C.

Executive Committee.

H. C. WHITE, of Georgia, *Chair.*;

J. L. SNYDER, of Michigan;

C. F. CURTISS, of Iowa;

W. H. JORDAN, of New York;

W. E. STONE, of Indiana.

OFFICERS OF SECTIONS.

College Work and Administration.

E. A. BRYAN, of Washington, *Chair.*;

H. C. PRICE, of Ohio, *Secy.*

Programme Committee. The Chairman and Secretary.

Experiment Station Work.

M. A. SCOVELL, of Kentucky, *Chair.*;

C. E. THORNE, of Ohio, *Secy.*

Programme Committee. H. J. WATERS, of Missouri; H. T. FRENCH, of Idaho;

C. E. THORNE, of Ohio.

STANDING COMMITTEES.

Instruction in Agriculture.

For three years, J. F. DUGGAR, of Alabama, and W. E. STONE, of Indiana; for two years, A. C. TRUE, of Washington, D. C., *Chair.*, and T. F. HUNT, of New York; for one year, H. T. FRENCH, of Idaho, and H. C. WHITE, of Georgia.

Graduate Study.

For three years, W. O. THOMPSON, of Ohio, and BROWN AYRES, of Tennessee; for two years, L. H. BAILEY, of New York, *Chair.*, and H. P. ARMSBY, of Pennsylvania; for one year, M. H. BUCKHAM, of Vermont, and R. H. JESSE, of Missouri.

Extension Work.

For three years, A. M. SOULE, of Virginia, and W. M. HAYS, of Washington, D. C.; for two years, K. L. BUTTERFIELD, of Rhode Island, *Chair.*, and C. R. VAN HISE, of Wisconsin; for one year, B. W. KILGORE, of North Carolina, and C. F. CURTISS, of Iowa.

Experiment Station Organization and Policy.

For three years, M. A. SCOVELL, of Kentucky, and C. E. THORNE, of Ohio; for two years, EUGENE DAVENPORT, of Illinois, *Chair.*, and C. D. WOODS, of Maine; for one year, W. A. HENRY, of Wisconsin, and H. J. WATERS, of Missouri.

LIST OF DELEGATES AND VISITORS IN ATTENDANCE.

- Alabama:** C. C. Thach and J. F. Duggar, delegates; F. Duggar, R. S. Mackintosh, and C. C. Thach, jr., visitors.
- Arkansas:** J. N. Tillman and W. G. Vincenheller, delegates.
- California:** B. I. Wheeler, delegate.
- Colorado:** B. O. Aylesworth and L. G. Carpenter, delegates.
- Connecticut:** R. W. Stimson, L. A. Clinton, and E. H. Jenkins, delegates; H. G. Manchester, visitor.
- Delaware:** H. Hayward, delegate.
- Florida:** P. H. Rolfs, delegate.
- Georgia:** H. C. White and R. J. Redding, delegates; C. L. Willoughby, Mrs. C. L. Willoughby, and P. L. Willoughby, visitors.
- Idaho:** H. T. French, delegate.
- Illinois:** E. Davenport and C. G. Hopkins, delegates; I. Bevier, H. A. Huston, H. W. Mumford, F. H. Rankin, and Mrs. F. H. Rankin, visitors.
- Indiana:** J. Troop and A. Goss, delegates; J. H. Skinner and J. A. Woodburn, visitors.
- Iowa:** A. B. Storms, C. F. Curtiss, and W. J. Kennedy, delegates; Mrs. C. F. Curtiss, Mrs. W. J. Kennedy, Mrs. A. B. Storms, and H. E. Summers, visitors.
- Kansas:** E. R. Nichols and C. W. Burkett, delegates; Mrs. E. R. Nichols and R. C. Nichols, visitors.
- Kentucky:** J. K. Patterson, M. A. Scovell, and H. Garman, delegates; J. J. Hooper, H. Vreeland, and Mrs. H. Vreeland, visitors.
- Louisiana:** T. D. Boyd and W. R. Dodson, delegates; D. N. Barrow, F. H. Burnette, W. H. Dalrymple, Mrs. C. H. Dameron, H. R. Fulton, J. E. Halligan, R. C. Howell, H. J. Milks, and J. C. Summers, visitors.
- Maine:** G. E. Fellows and C. D. Woods, delegates; W. D. Hurd and Mrs. C. D. Woods, visitors.
- Maryland:** R. W. Silvester, delegate; W. L. Amoss, visitor.
- Massachusetts:** K. L. Butterfield, W. P. Brooks, and J. L. Ellsworth, delegates; F. W. Rane and F. A. Waugh, visitors.
- Michigan:** J. L. Snyder, delegate; W. J. Beal and L. R. Taft, visitors.
- Minnesota:** S. B. Green and H. Snyder, delegates.
- Mississippi:** J. C. Hardy, W. L. Hutchinson, and A. B. McKay, delegates; E. R. Lloyd and W. R. Perkins, visitors.
- Missouri:** H. J. Waters and P. Evans, delegates.
- Montana:** F. B. Linfield, delegate.
- Nebraska:** E. B. Andrews and E. A. Burnett, delegates.
- New Hampshire:** E. D. Sanderson, delegate.
- New Jersey:** W. H. S. Demarest and E. B. Voorhees, delegates; W. S. Myers, visitor.
- New Mexico:** L. Foster and R. F. Hare, delegates.
- New York:** L. H. Bailey and W. H. Jordan, delegates; B. von Herff, visitor.

- North Carolina:** C. M. Conner and T. Butler, delegates; R. S. Woglum, visitor.
- North Dakota:** J. H. Worst and J. H. Shepperd, delegates; Mrs. J. H. Shepperd and Mrs. J. H. Worst, visitors.
- Ohio:** H. C. Price, T. C. Laylin, and C. E. Thorne, delegates; Mrs. T. C. Laylin and Mrs. C. E. Thorne, visitors.
- Oklahoma:** W. L. English, delegate.
- Oregon:** P. L. Campbell, visitor.
- Pennsylvania:** N. B. Critchfield and H. P. Armsby, delegates; E. B. Engle, visitor.
- Porto Rico:** D. W. May, delegate.
- Rhode Island:** H. Edwards and H. J. Wheeler, delegates.
- South Carolina:** P. H. Mell, J. N. Harper, and C. L. Newman, delegates; Mrs. P. H. Mell and Mrs. C. L. Newman, visitors.
- South Dakota:** R. L. Slagle and J. W. Wilson, delegates.
- Tennessee:** B. Ayres and H. A. Morgan, delegates.
- Texas:** H. H. Harrington and J. W. Carson, delegates; A. F. Conradi, visitor.
- Utah:** W. J. Kerr and P. A. Yoder, delegates.
- Vermont:** M. H. Buckham and J. L. Hills, delegates.
- Virginia:** A. M. Soule, delegate.
- Washington:** E. A. Bryan, delegate.
- West Virginia:** D. B. Purinton, delegate.
- Wisconsin:** C. R. Van Hise, W. A. Henry, G. C. Humphrey, and E. P. Sandsten, delegates.
- Wyoming:** A. Nelson and B. C. Buffum, delegates.
- United States Department of Agriculture:** W. M. Hays, assistant secretary, delegate; A. C. True, delegate; E. W. Allen, D. J. Crosby and J. Hamilton, visitors, of the Office of Experiment Stations; C. Curtice and B. H. Ransom, visitors, of the Bureau of Animal Industry; F. C. Bishopp, visitor, of the Bureau of Entomology; E. C. Chilcott, C. S. Scofield, and S. M. Tracy, visitors, of the Bureau of Plant Industry.
- Bureau of Education:** L. A. Kalbach, delegate.
- Canada:** G. C. Creelman, visitor.

CONSTITUTION.

NAME.

This association shall be called the Association of American Agricultural Colleges and Experiment Stations.

OBJECT.

The object of this association shall be the consideration and discussion of all questions pertaining to the successful progress and administration of the colleges and stations included in the association, and to secure to that end mutual cooperation.

MEMBERSHIP.

(1) Every college established under the act of Congress approved July 2, 1862, or receiving the benefits of the act of Congress approved August 30, 1890, and every agricultural experiment station established under State or Congressional authority, the Bureau of Education of the Department of the Interior, the Department of Agriculture, and the Office of Experiment Stations of the last-named Department, shall be eligible to membership in this association.

(2) Any institution a member of the association in full standing may send any number of delegates to the meetings of the association. The same delegate may represent both a college and a station, but shall vote in only one section and shall cast only one vote in general sessions. Other delegates may be designated by any institution to represent it in specified divisions of the sections of the association, but such delegates shall vote only in such divisions, and no institution shall be allowed more than one vote in any sectional meeting.

(3) Delegates from other institutions engaged in educational or experimental work in the interest of agriculture or mechanic arts may, by a majority vote, be admitted to conventions of the association, with all privileges except the right to vote.

(4) In like manner, any person engaged or directly interested in agriculture or mechanic arts who shall attend any convention of this association may be admitted to similar privileges.

SECTIONS.

(1) The association shall be divided into two sections: (a) A section on college work and administration. (b) a section on experiment station work.

The section on college work and administration shall be composed of the presidents or acting presidents of colleges and universities represented in the association, or other representatives of such institutions duly and specifically accredited to this section, and no action on public and administrative questions shall be final without the assent of this section.

The section on experiment station work shall be composed of the directors or acting directors of experiment stations represented in the association, or of other representatives of such stations duly and specifically accredited to this section.

(2) Members of these two sections (and no others) shall be entitled to vote both in general sessions and in the section to which they respectively belong.

The representative appointed by the United States Bureau of Education shall be assigned to the section on college work and administration; the representative of the Office of Experiment Stations to the section on experiment station work; and the representative of the United States Department of Agriculture to either section as he may elect and the section by vote authorize; but such election once made and authorized may not be changed during the sessions of a given convention.

Each section may create such divisions as it may from time to time find desirable, and shall elect its own chairman and secretary for sectional meetings, whose names shall be reported to the association for record.

(3) Each section shall conduct its own proceedings, and shall keep a record of the same, and no action of a section, by resolution or otherwise, shall be valid until the same shall have been ratified by the association in general session, and in the case provided for in the foregoing paragraph (1) shall also have been approved by the section on college work and administration.

MEETINGS.

(1) This association shall hold at least one meeting in every calendar year, to be designated as the annual convention of the association. Special meetings may be held at other times, upon the call of the executive committee, for purposes to be specified in the call.

(2) The annual convention of the association shall comprise general sessions and meetings of the sections, and provision shall be made therefor in the programme. Unless otherwise determined by vote, the association will meet in general session in the forenoons and evenings of the convention and the sections in the afternoons.

OFFICERS.

(1) The general officers of this association, to be chosen annually, shall be a president, five vice-presidents, a bibliographer, and a secretary, who shall also be treasurer; and an executive committee of five members, three of whom shall be chosen by the section on college work and administration and two by the section on experiment station work; *Provided, however*, That a member chosen by either section need not be a member of that section. The executive committee shall choose its own chairman.

(2) Each section shall, by ballot, nominate to the association in general session for its action, a chairman and a secretary for such section.

(3) The president, vice-presidents, secretary, and bibliographer of this association shall be elected by ballot upon nomination made upon the floor of the convention, and shall hold office from the close of the convention at which they are elected until their successors shall be chosen.

(4) Any person being an accredited delegate to an annual meeting of the association, or an officer of an institution which is a member of the association in full standing at the time of election, shall be eligible to office,

DUTIES OF OFFICERS.

(1) The officers of the association shall perform the duties which usually devolve upon their respective offices.

(2) The president shall deliver an address at the annual convention before the association in general session.

(3) The executive committee shall determine the time and place of the annual conventions and other meetings of the association, and shall, between such conventions and meetings, act for the association in all matters of business. It shall issue its call for the annual conventions of the association not less than sixty days before the date on which they are to be held, and for special meetings not less than ten days before such date. It shall be charged with the general arrangements and conduct of all meetings called by it. It shall designate the time and place of the convention; it shall present a well-prepared order of business—of subjects for discussion—and shall provide and arrange for the meetings of the several sections. The subjects provided for consideration by each section at any convention of the association shall concentrate the deliberations of the sections upon not more than two lines of discussion, which lines, as far as possible, shall be related. Not more than one-third of the working time of any annual convention of the association shall be confined to miscellaneous business.

FINANCES.

At every annual convention the association, in general session, shall provide for obtaining the funds necessary for its legitimate expenses, and may, by appropriate action, call for contributions upon the several institutions eligible to membership; and no institution shall be entitled to representation or participation in the benefits of the association unless such institution shall have made the designated contribution for the year previous to that in and for which such question of privilege shall arise, or shall have said payment remitted by the unanimous vote of the executive committee.

AMENDMENTS.

This constitution may be amended at any regular convention of the association by a two-thirds vote of the delegates present, if the number constitute a quorum: *Provided*, That notice of any proposed amendment, together with the full text thereof and the name of the mover, shall have been given at the next preceding annual convention and repeated in the call for the convention. Every such proposition of amendment shall be subject to modification or amendment in the same manner as other propositions, and the final vote on the adoption or rejection shall be taken by yeas and nays of the institutions then and there represented.

RULES OF ORDER.

(1) The executive committee shall be charged with the order of business, subject to special action of the convention, and this committee may report at any time.

(2) All business or topics proposed for discussion and all resolutions submitted for consideration of the convention shall be read and then referred, without debate, to the executive committee, to be assigned positions on the programme.

(3) Speakers invited to open discussion shall be entitled to twenty minutes each.

- (4) In general discussions the ten-minute rule shall be enforced.
- (5) No speaker shall be recognized a second time on any one subject while any delegate who has not spoken thereon desires to do so.
- (6) The hours of meeting and adjournment adopted with the general programme shall be closely observed, unless changed by a two-thirds vote of the delegates present.
- (7) The presiding officer shall enforce the parliamentary rules usual in such assemblies and not inconsistent with the foregoing.
- (8) Vacancies which may arise in the membership of standing committees by death, resignation, or separation from the association of members shall be filled by the committees, respectively.

PROCEEDINGS OF THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

MINUTES OF THE GENERAL SESSION.

MORNING SESSION, WEDNESDAY, NOVEMBER 14, 1906.

The convention was called to order at 10 o'clock a. m., at the Istrouma Hotel, Baton Rouge, by the president, M. H. Buckham.

The proceedings were opened with prayer by the Rev. Louis Tucker, of Baton Rouge.

After the call of the roll of States the report of the executive committee was presented by the chairman of the committee, H. C. White, of Georgia, as follows:

REPORT OF THE EXECUTIVE COMMITTEE.

The executive committee appointed at the nineteenth annual convention of the association held at Washington, D. C., November 14-16, 1905, met immediately upon adjournment of the convention and organized by the selection of President H. C. White, of Georgia, as chairman. An abstract memorandum of the proceedings of the convention of 1905 was prepared by the chairman and posted to each member of the association under date of December 10, 1905. The proceedings in full were edited by the chairman and placed in the hands of the Office of Experiment Stations, U. S. Department of Agriculture, for publication January 10, 1906. Eight subsequent meetings of the committee were held: At Washington, D. C., December 1-2, 1905; January 20, February 12-13, March 30, April 16, and June 10, and at Baton Rouge, La., November 13, 1906. Individual members of the committee made other visits to Washington in the interest of the association. Ten circulars of information were issued and posted to members of the association. The final call for the present (twentieth) annual convention was issued August 2, and the programme for the convention, as prepared by the committee, November 1, 1906.

The last convention, by unanimous and enthusiastic vote, requested the executive committee to consider favorably an invitation to hold the present convention in California immediately preceding the proposed annual meeting of the National Educational Association in that State. Immediately after the adjournment of the convention the committee on graduate study addressed a formal communication to the executive committee, stating the belief that a meeting of the association in California at the time proposed would interfere seriously with the graduate school, which the association had authorized and the committee had undertaken, to be held at the University of Illinois in July, 1906. This communication was submitted by circular to the members of the association, with request for expression of opinion, in view of the conflicting instructions of the convention. After careful consideration of the replies received, the executive committee advised the committee on graduate study to proceed with arrangements for the graduate school in July, and decided to hold the convention in California in August. Considerable trouble and delay were experienced in securing satisfactory railroad rates, but, this finally accomplished,

a call was issued April 6 for the convention of 1906 in California, beginning August 8. The disastrous calamities of earthquake and fire on the Pacific coast April 18, involving the abandonment of the proposed meeting of the National Educational Association, made necessary the withdrawal of this call May 14, with the reluctant consent of our intending hosts in California, and the decision was then reached to accept the courteous invitation of the authorities of Louisiana, of Baton Rouge, and the Louisiana State University, to hold the convention in Baton Rouge in November.

The most noteworthy event of the year was the final passage by Congress of the Adams bill (approved March 16, 1906) to increase the annual appropriations to the agricultural experiment stations. Your committee had several conferences with Mr. Adams before and during the session of Congress, and the terms of the act as approved are, it is hoped, satisfactory to members of the association. Mr. Adams gave himself unsparingly to the advocacy of the bill, your committee aided him to the full extent of its ability, and members of the association responded promptly and efficiently to the requests of the committee to make known to members of Congress the merits of the measure. The extent to which it commended itself to the statesmanship of the nation is shown in the fact that not one vote was recorded against its passage in either House of Congress, and it was immediately approved by the President when submitted to him for consideration.

A question of interpretation of the clause of the act indicating the first fiscal year for which the appropriations were provided arose in the office of the Comptroller of the Treasury. To cure any possible defect and to make plain the intent of the act, Mr. Adams proposed a declaratory amendment to the appropriation bill for the Department of Agriculture, then pending in the Senate. The Secretary of Agriculture heartily approved the amendment, drafted it in proper form, and submitted it, with his official approval, to the Senate committee. The Senate bill was delayed in passage by the discussion which arose in connection with the meat-inspection provisions which it carried, but finally passed Congress with the declaratory amendment, as submitted by the Secretary of Agriculture, on June 30. The appropriations provided by the Adams Act for the fiscal year ending June 30, 1906, were duly paid over to the stations by the Treasury shortly thereafter. The attention of the association is called to the important fact that the present Comptroller of the Treasury has, furthermore, expressed the opinion that the terms of the Adams Act do not provide for appropriations beyond the fiscal year ending June 30, 1911. Unless this ruling shall be changed in the interim it will behoove the representatives of the association to be vigilant at the proper time to secure necessary Congressional action to continue the appropriations. This should not be difficult, as it would probably involve only maintaining the maximum amount in the regular appropriation bill carrying the appropriations to the stations. In this connection it may be proper to report that your committee became aware of a strong sentiment in Congress favorable to the repeal of the so-called "continuing appropriations" acts—those making "permanent and indefinite appropriations." A bill to this effect (H. R. 8991) was introduced December 18, 1905, by Hon. James A. Tawney, chairman of the House Committee on Appropriations. Your committee is uncertain of the probable effect of such repeal upon the Hatch Act, the Morrill (1890) Act, and the Adams Act, but it might involve the necessity for specific action by Congress, either once for all or at each session, to protect the appropriations made by them. Your committee communicated immediately with Mr. Tawney, asking an opportunity to be heard in favor of exempting the acts named from the operation of his bill when it should be considered in committee. Other important matters prevented such consideration during the last session of Congress, but your committee is assured that a hearing will be granted before the bill is reported from committee. Attention should be given at the proper time by the representatives of the association to this important matter.

Obedying the instructions of the association given at the last annual convention, "to safeguard the interests of all * * * measures" in Congress affecting the association, "but to concentrate its efforts at any particular session upon the bill or bills which may seem to be in the most favorable condition for passage," your committee devoted its energies chiefly to securing the passage of the Adams Act at the last session of Congress. Mr. Mondell reintroduced the mining school bill, and the committee cooperated actively with him in efforts to obtain consideration for the bill. The mutual endeavors were,

^a U. S. Dept. Agr., Office of Experiment Stations Bul. 164, p. 46.

however, without avail. The bill, in the form familiar to the association, is still on the Union Calendar of the House, and may receive consideration at the short session of Congress beginning in December.

Mindful of the interest expressed by resolution of the association^a in the establishment of forestry instruction in the land-grant colleges, your committee conferred with the chief officers of the Forest Service and others interested in the matter, and suggested the abandonment of a pending bill in this interest and a substitute modification of the Mondell bill to provide for forestry instruction. The suggestion was favorably received, but the great pressure of other important business in Congress has caused the whole matter to lie in abeyance. It may be taken up again at the pleasure of the association.

In appearance before Congressional committees in connection with the Adams bill and on other appropriate occasions, your committee took care "to request Congress to continue the policy that it has adopted in the Morrill bill, the supplementary bill, and the Hatch Act, according to the lines there laid down," and also to present "the claims of the experiment stations to the proper support and consideration of Congress," as instructed by the association.^b Your committee also advocated that authority be given the Office of Experiment Stations of the Department of Agriculture to carry on "its work of promoting the cause of agricultural education in the United States."^c Due attention was also given to proposed legislation affecting the interests of the association, as, for example, the bills introduced simultaneously in the Senate and House proposing appropriations to State normal schools for agricultural education. Fortunately, perhaps, the major portion of such proposed legislation rarely reaches the stage which may be regarded as hopeful, or dangerous, according to the point of view.

Very important questions which may arise in connection with the administration and use of the Adams funds have had the serious consideration of your committee. They have also engaged the attention of the association's standing committee on station organization and policy. The report of the latter committee to be made to this convention will probably deal with some of these questions. It is recommended that in the discussion of that report a full and free expression of views be given by members of the association to the end that the important and useful work of the agricultural experiment stations in the several States may gain greatest value from the additions now made to their resources. The Director of the Office of Experiment Stations of the U. S. Department of Agriculture, who has been designated to represent the Secretary of Agriculture in so much of the administration of the Adams Act as pertains to Federal authority, is a member of this association, and will no doubt contribute much of value to the discussion.

Proper initiative steps were taken by your committee to secure the creation of a department on rural education in the National Educational Association.^d It was ascertained that it was necessary to secure the signatures of not less than twenty active members of the National Educational Association to a memorial requesting the consent of the council of the association to the formation of a new department as indicated, to be presented to the council immediately in advance of an annual meeting of the association. The memorial was prepared and copies distributed for signatures. In this matter your committee was fortunate to secure the valuable services of Mr. Dick J. Crosby, of the Office of Experiment Stations, United States Department of Agriculture, who conducted all the correspondence and cared for all details involved. The abandonment of the 1906 meeting of the National Educational Association made it unnecessary to proceed further in the matter at that time. Your committee would ask the association to consider whether it would not be wise to instruct the executive committee to present the memorial to the council of the National Educational Association only at a time when it is assured that a sufficient number of members of this association or others equally interested in the subject are present at the meeting of the National Educational Association to insure the success and value of the proposed new department.

In December, 1905, your committee, through the chairman, addressed a communication to President Henry S. Pritchett, of the board of trustees of the Carnegie Foundation for the Advancement of Teaching, asking the board respect-

^a U. S. Dept. Agr., Office of Experiment Stations Bul. 164, p. 53.

^b *Ibid.*, p. 46.

^c *Ibid.*, p. 56.

^d *Ibid.*, p. 47.

fully to consider the propriety and advisability of including the land-grant colleges among the beneficiary institutions of the Foundation. A courteous reply explained that the trustees were not then prepared to consider the matter. Under date of September 28, 1906, however, President Pritchett has written the chairman that the board of trustees will consider the question of extending the benefits of the Foundation at a meeting to be held in New York City, November 21, 1906, and at that time they would be glad to receive a statement from the land-grant colleges and hear from their representative in person, if desired. In view of the near approach of the date indicated, your committee has prepared a statement setting forth the reasons why, in its judgment, the land-grant colleges might properly share in the benefits of the Foundation. The association is asked to determine at this convention whether and in what manner this or a similar statement shall be presented to the board of trustees of the Carnegie Foundation on November 21. Your committee extended a cordial invitation to President Pritchett to attend this convention of the association, and greatly regret that other engagements prevent his acceptance of the invitation.

For the third consecutive year it is the sorrowful duty of your committee to announce to the association the death of one of its distinguished founders. Following fast the demise of Major Alvord in 1904 and of President Goodell in 1905, President George W. Atherton, of Pennsylvania, departed this life July 24, 1906. Foremost among those who organized this association; ever chief among the wisest of its councillors; its first president and continued in office for several terms by unanimous desire; member for many years of its executive committee; devoted to the interests of the association and its purposes, and lavish in his expenditure of personal effort in its service, his departure from our ranks is a personal grief and the occasion of sorrowful regret to each member of this body.

With this sad announcement of the death of the first member of the association must be linked that of its latest benefactor. Hon. Henry Cullen Adams, of Wisconsin, author and achiever of the latest national legislation in benefaction of agricultural research and agricultural progress, died on July 9, 1906, only a few weeks after the approval of the great act which will forever bear his name. There is little doubt that his incessant labors in behalf of this beneficent legislation entailed the strain which brought his frail physical powers to the breaking point. "Greater love hath no man than this, that a man lay down his life for his friends."

Your committee has thought it eminently appropriate that the names of these two great and worthy men should be joined in an hour set apart during the proceedings of this convention to an expression of respect and esteem for their gracious memories.

The finances of the association have been economically administered, all obligations met, and a satisfactory balance left in the treasury.

Respectfully submitted for the committee.

H. C. WHITE, *Chairman*.

On motion, the report was received and ordered placed on file.

CARNEGIE FOUNDATION.

On motion of G. E. Fellows, of Maine, the chairman of the executive committee was selected as a delegate to represent the land-grant colleges at the meeting of the trustees of the Carnegie Foundation for the Advancement of Teaching November 21, 1906.

REPORT OF TREASURER.

J. L. Hills, of Vermont, secretary and treasurer of the association, presented the following report:

Report of treasurer, November 14, 1905, to November 14, 1906.

Cash on hand at Washington meeting-----	\$995. 87
Dues received -----	1, 500. 00
Total -----	2, 495. 87
Disbursements -----	1, 537. 49
Balance in bank November 14, 1906-----	958. 38

Classification of disbursements:

Executive committee	\$1, 230. 53
Committee on station organization	172. 36
Secretary-treasurer, stationery, postage, telegrams	35. 35
Stenographer, Washington	74. 25
Wreath, funeral Congressman Adams	25. 00
Total	1, 537. 49

Joseph L. Hills, treasurer Association of American Agricultural Colleges and Experiment Stations, in account with Graduate School of Agriculture subscription fund, 1905-6.

Receipts:

Subscriptions for 1905-22	\$550. 00
Subscriptions for 1906-16	400. 00
Total	950. 00

Disbursements:

Expenses committee on graduate school	{ \$59. 16 53. 30 13. 02	127. 48
Paid University of Illinois	{ 487. 54 334. 98	822. 52
Total		950. 00

Joseph L. Hills, treasurer Association of American Agricultural Colleges and Experiment Stations, in account with Adams testimonial fund:

Receipts from 28 individuals	\$56. 00
Disbursements to 28 individuals	56. 00

The report was referred to the auditing committee, consisting of R. W. Stimson, of Connecticut; J. F. Duggar, of Alabama, and L. G. Carpenter, of Colorado, which later reported as follows:

The committee appointed for auditing the accounts of the treasurer have—
(1) Examined the original vouchers and found them properly approved and receipted.

(2) Compared the vouchers with the checks and the books and found the amounts exactly to coincide.

(3) Examined the balances as stated and found them correct.

The committee commends the excellent order with which the work of the treasurer is conducted and the accounts of the committees and members of committees are rendered.

The report was approved.

REPORT OF THE BIBLIOGRAPHER.

A. C. True, of the Office of Experiment Stations, submitted the following report:

In view of the fact that the reference lists which have heretofore made up the report of the bibliographer are now noted from time to time in the Experiment Station Record and indexed together under the word "Bibliography" in the annual subject index of that journal, it is deemed unnecessary to continue to include such lists in reports to this association. The bibliographer therefore submits as his report this year as complete a list of books written by agricultural college and experiment station officers as he has been able to prepare with the means at his command, believing that such a list will be of interest and value as showing the large and creditable contribution of agricultural colleges and experiment

stations of this country to the literature of scientific agriculture in its more finished and permanent form.

The list comprises 389 titles of books, the work of 198 men and women now or at one time connected with agricultural colleges and experiment stations in the United States. It includes books on practically all phases of agriculture and allied sciences, as well as a few books on other subjects.

This list is in a sense supplementary to the very instructive article on the "Development of the Text-book of Agriculture in North America," contributed by Dean Bailey to the Annual Report of the Office of Experiment Stations for 1903, pages 689-712, the two together showing in a very striking manner the rapid progress which has been made in this country in building up a substantial body of agricultural literature suited to American conditions.

BOOKS BY AGRICULTURAL COLLEGE AND EXPERIMENT-STATION OFFICERS.

[Books marked with an asterisk (*) are now in the Office of Experiment Stations collection; of those marked with an asterisk and a dagger (*†) the earlier but not latest editions are in the collection.]

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The report was accepted and ordered included in the proceedings of the convention.

NATIONAL UNIVERSITY AT WASHINGTON.

E. B. Andrews, of Nebraska, and G. E. Fellows, of Maine, presented the question of the appointment of a committee to cooperate with the committee from the National Association of State Universities, with a view to the furtherance of a plan for the establishment of a national university at Washington, and the matter was referred to the executive committee (see p. 58).

IMPROVEMENT OF THE APPLE.

R. S. Mackintosh, of Alabama, presented a memorial on this subject drawn up by the horticulturists in attendance at the Graduate School of Agriculture, which was subsequently withdrawn.

EXECUTIVE COMMITTEE AND THE ADAMS ACT.

E. B. ANDREWS, of Nebraska. I wish to express the sense of gratitude and obligation which I feel and which all engaged in our work feel toward the executive committee for its prompt, earnest, and efficient endeavors in connection with the passage of the Adams Act. If it is proper, I move, Mr. President, that the gratitude of this association is considered due and is hereby tendered to the executive committee for the painstaking and efficient efforts that they made toward the passage of the Adams Act.

The motion was seconded and unanimously adopted.

H. C. White, of Georgia, expressed briefly the thanks of the executive committee for this action of the convention.

EXPENDITURE OF ADAMS FUND BALANCES.

C. C. Thach, of Alabama, introduced the following resolution:

Whereas there was much confusion and uncertainty on the part of many of the experiment stations in the United States concerning the date when the appropriations made by Congress under the Adams Act for 1905-6 became available; and

Whereas through this confusion and uncertainty many of the stations in the brief time allowed were unable to formulate careful and judicious plans for the expenditure of said funds, and so consequently failed to secure the full amount of said appropriation for 1905-6: Therefore, be it

Resolved, That the executive committee be requested to investigate the extent to which the stations failed to receive the full appropriation referred to and to secure such remedy as may seem practicable.

The resolution was referred to the executive committee. Subsequently it was reported to the convention and adopted.

CANADIAN DELEGATES TO THE CONVENTIONS OF THE ASSOCIATION.

J. C. Hardy, of Mississippi, offered the following resolution, which was referred to the executive committee:

Resolved, That the institutions of the Dominion of Canada engaged in educational and experimental work in the interest of agriculture or mechanic arts be, and are hereby, invited to send delegates to the conventions of this association, with all privileges, in accordance with the provisions of the constitution of the association.

The resolution was subsequently reported and adopted.

MEMORIAL TO PRESIDENT GEORGE W. ATHERTON.

H. P. Armsby, of Pennsylvania, delivered the following address:

George W. Atherton, president of the Pennsylvania State College, died at State College, Pa., on July 24, 1906, having nearly reached the traditional three-score years and ten.

The record of these seventy years is a notable one, yet the simple outline of his life includes few striking or romantic events. The sturdy Yankee boy of 12, earning his own living and helping to support his widowed mother; the young student, working his way through academy and college; the citizen-soldier of the civil war; the teacher; the college professor, and finally the

college president—all these are such familiar figures in our national annals that they attract scarcely more than a passing glance. Yet this brief and almost colorless enumeration covers a life of intense, unrelenting, and effective activity. With the exception of a brief military experience, it was essentially the academic life, yet its concrete and far-reaching results should forever refute, were such refutation necessary, the notion that the academic life is a pale abstraction, remote from the practical affairs of men.

George W. Atherton was born at Boxford, Mass., on June 20, 1837, coming of good New England stock. Left fatherless at the age of 12, he supported himself and aided his mother and sisters by work in a cotton mill and later on the farm and by teaching. He worked his way through Phillips Exeter Academy, at Andover, Mass., and in 1860 entered the sophomore class at Yale. At the outbreak of the civil war he responded to the call to arms, and on recommendation of President Woolsey was commissioned first lieutenant in the Tenth Connecticut Volunteers. He took part in Burnside's North Carolina expedition, where he served with conspicuous bravery and efficiency, and was promoted to a captaincy.

Leaving the Army in 1863 on account of failing health, he was graduated from Yale with his class, and on Christmas of the same year was married to Frances D. W. Washburn, who, with two sons and two daughters, survive him. For the next four years he was a professor in the Albany Boys' Academy, of Albany, N. Y., and for the succeeding year a professor, and during most of the year acting principal, of St. John's College at Annapolis, Md.

His first formal connection with industrial education was in 1868, when he was called to the newly established Illinois Industrial University—since become the University of Illinois—and took part in the organization of that institution, being closely associated with its first president, Doctor Gregory. After a single year's activity there, however, he accepted a very flattering offer from Rutgers College, and for the succeeding fourteen years filled the chair of political economy at that institution.

This was a newly established chair in a college which was at that time quite strictly of the classical type, and the problem of finding standing ground for the new subject without unduly encroaching on the old or arousing the antagonism of other departments was met by the young professor of 32 with that successful combination of firmness and diplomacy with which we all were to become familiar in later years.

As we should expect, he took a broad view of the duties of his position, and far from confining himself to the instruction of his students, he took an active interest in all pending political and economic questions and responded freely to every call to serve the larger public.

In 1873 he served as a member of the board of visitors to the United States Naval Academy. In 1875 he was a member of the commission to investigate the charges of corruption at the Red Cloud Indian Agency preferred by Prof. O. C. Marsh, of Yale, having been added along with the Hon. Timothy Howe, of Michigan, by personal action of President Grant, to a commission of three previously appointed by the Secretary of the Interior. In 1876, much against his wish, he was made the Republican candidate for Congress for his district. Although the district was hopelessly Democratic, he threw himself into the contest with characteristic energy and, while not elected, ran considerably ahead of the Presidential ticket. My personal acquaintance with Doctor Atherton dates from that time, when I was a young assistant at Rutgers, and I well remember seeing him frequently, after a night trip to some political meeting, hastening across the campus to morning chapel with a vigor which we younger men could more easily admire than imitate.

In 1878 he was appointed chairman of a commission to prepare and present to the legislature of New Jersey a digest and revision of the State system of taxation. While engaged in this work he found time to study law, and was admitted to the New Jersey bar while still carrying on his college work.

Both his studies in economics and his activity in public affairs naturally led him to interest himself in the development of industrial education, which occupied so large a share of educational thought during those years, particularly in connection with the land-grant act of 1862. We may suspect, too, that his early connection with the movement in Illinois had much to do with turning his thoughts in that direction. In 1873 he presented an elaborate paper before the National Educational Association upon the subject "The relation of the General Government to education." In the course of this paper he traced in con-

siderable detail the history and development of the land-grant colleges up to that time and emphasized those broad conceptions of their functions in our educational system and of the importance of the type of education which they were designed to give, to whose concrete development he was to contribute so largely.

In 1882 he accepted the presidency of The Pennsylvania State College and began that work for which his previous life had been the unconscious preparation. For any adequate estimate of his achievements in that office some knowledge of the history of the college and of its condition at the time he took charge is an indispensable preliminary.

The Pennsylvania State College was chartered under the name of the Farmers' High School of Pennsylvania February 22, 1855, but fifteen years after Liebig's famous report on "Chemistry in its application to agriculture and physiology," which may be regarded as marking the beginning of modern agricultural science. Lawes and Gilbert had begun their classic investigations at Rothamsted only twelve years before. The first agricultural experiment station, at Moeckern, was then only three years old, and the first modern department of agriculture in a German university was still to be established five years later at Halle. The Farmers' High School of Pennsylvania was one of the first fruits of that revolution in the subject-matter and methods of education which characterized the middle years of the nineteenth century. Its foundation was so closely synchronous with that of the Michigan and the Maryland agricultural colleges that the degree of priority is largely a question of definition.

Owing its origin to the initiative of the State Agricultural Society, and equipped in part by the State, but largely by private generosity, it opened its doors to students February 16, 1859, the long delay being due largely to the financial panic of 1857. In the succeeding year it was fortunate enough to secure as its first president Dr. Evan Pugh, a man far in advance of his time in his grasp of the essentials of industrial education. With the passage of the first Morrill Act in 1862 the scope of the institution was enlarged to cover the mechanic arts as well as agriculture, and its name was changed to the Pennsylvania Agricultural College. A comprehensive scheme of organization was formulated by its president, and the institution seemed well started on a most promising career when its hopes were blighted by the sudden and untimely death of Doctor Pugh in April, 1864. There followed a period of vacillation and uncertainty, but as the impulse given by Doctor Pugh died out the college gradually settled down into the "Middle Ages" of its history, with a small number of students, chiefly in the preparatory department, and with its functions as an industrial college largely in abeyance, except that experimental work in agriculture was given a prominent position, especially after the purchase by the State in 1867 of three experimental farms. While the Morrill fund was finally, after considerable delay and controversy, assigned to the college, the State made no other provision for the administration of the grant or for supervising the execution of the trust to which it had explicitly pledged its faith when accepting the fund.

The natural consequence of State neglect and of the lack of a definite and aggressive policy did not fail to ensue. The college dwindled and the public forgot or ignored its position as a State institution officially designated to carry out certain obligations to the National Government assumed by the Commonwealth. For the college year 1881-82, the year immediately preceding Doctor Atherton's administration, the total registration is reported as 145, of whom, however, only 47 were taking the regular four years' course. The graduates of 1882, however, reached the unusually large number of 9, the largest since 1868, and a number not again reached until 1885. For the following college year, 1882-83, the number of collegiate students dropped to 34 and the total enrollment to 87, while the graduating class numbered 5. At that time the entire work of the college was carried on under the one roof of "Old Main," which also served to shelter the families of several professors, and the total assured income of the institution was \$30,000 per year from the Morrill fund. Such was the institution of which Doctor Atherton assumed charge in 1882. The college was a small affair, the village but a hamlet, 12 miles from the nearest railroad point, and the conditions of life decidedly primitive. I remember hearing him tell, with probably more enjoyment in the retrospect than in the experience, of sitting in his office in the college building on many an evening and being startled from his work as some sudden noise or call reminded him that the building was lighted entirely by lamps, while the supply

of coal oil and the ammunition for the cadet battalion had been thoughtfully stored in the basement in the immediate vicinity of the president's office.

The growth of the college in numbers and in material equipment in the twenty-four years of Doctor Atherton's administration has been nothing short of marvelous. The enrollment of 87 in 1882-83 became 800 in 1905-6; the graduating class, on whom he conferred their degrees as his last official act, numbering 86. The faculty has increased in the same period from 16 to 66, besides 20 "assistants in administration." The work which in 1882 was carried on in a single building is now distributed among fourteen, the cost of the new buildings erected having been nearly \$1,000,000, this including the magnificent Schwab Auditorium and Carnegie Library. The total of the State appropriations to the college during the period is nearly \$1,500,000, as compared with \$183,000 during all its previous history.

Such are some of the outward and visible signs of the regeneration of The Pennsylvania State College. Their inner significance can be fully comprehended only by those who have watched its progress year by year.

At the beginning of his administration there was committed to Doctor Atherton's charge an insignificant and almost friendless institution, with small resources and with a formidable heritage of indifference, distrust, or active enmity on the part of the public. To overcome these appalling difficulties he had, besides the noble traditions of struggle and sacrifice on the part of its few founders and friends (notably several members of the board of trustees), only a small but able and devoted band of instructors and his own strong personality and indomitable energy.

At once he recalled the college from its groping after a reason for being and set it again upon the path from which it had wandered after the death of its first president. In his first official report to the trustees he set forth clearly and convincingly its functions as an institution for industrial education, and from that ideal he never swerved. Over and over again he iterated and reiterated and fairly hammered into the public consciousness the broad conception of "The liberal and practical education of the industrial classes in the several pursuits and professions of life," which he had outlined so clearly before the National Educational Association nine years before. He took his stand unalterably upon the provisions of the first Morrill Act, that great charter of industrial education, with a faith in the outcome which events have abundantly justified.

Having thus laid down the lines for the future growth of the college, his task was to win popular approval of this educational programme and public confidence in the college as the agency for its execution. His success in accomplishing this herculean task is suggested by the material progress which I have barely indicated, and this constitutes the essential and vital achievement of his administration. There are those among my hearers who have personal knowledge of those early days and can testify to the revolution in public sentiment brought about in less than a generation. From the outset his appeal was constantly and consistently to the honor and the pride of the Commonwealth. The State had accepted the bounty of the National Government and had solemnly pledged its faith to carry out the provisions of the contract. He called upon it to redeem this pledge in a manner worthy of a great and rich Commonwealth, and to provide its youth with facilities for industrial education equal to the best. To this appeal, patiently repeated and seconded by a phenomenal ability to influence and persuade men, Pennsylvania has gradually but surely and with constantly growing enthusiasm responded. The neglect of years has been at least partially made good and the long struggle for recognition was crowned, in the last legislature, by the unopposed passage of a bill reorganizing the board of trustees and settling forever the status of the college as a State institution.

I need not remind this audience that despite the demands of his college work Doctor Atherton found time and energy for other notable public activities.

His services in securing the passage of the Hatch Act and the second Morrill Act, his part in the organization of this association, his services for two years as its first president, and his varied activities in other capacities have already been the subject of eulogy, and are too fresh in our minds to need enumeration.

In 1887 he was appointed by Governor Beaver chairman of a commission of five, appointed under a joint resolution of the legislature, "to make inquiry and report to the next legislature * * * respecting the subject of industrial education." Special reference was had in the resolution to the question of the incorporation of industrial training into the existing system of public educa-

tion, and to the training of teachers for this purpose. The report of this commission, which was largely his work, was recognized as the most comprehensive and thorough treatment of the subject up to that time. In 1891 he was for the second time appointed on the Board of Visitors to the United States Naval Academy. In 1895 he was appointed a member of the College and University Council of Pennsylvania, of which he continued a member until his death.

Doctor Atherton had the courage and poise of the born leader of men. Never dismayed or disconcerted by opposition or attack, accepting defeat as the stepping stone to future success, with an open mind welcoming every suggestion from others, yet with supreme confidence in his own carefully considered conclusions, he bore his great responsibilities with a quietness and simplicity which were an inspiration to his associates. He was an optimist in the best sense, believing profoundly that right is stronger than wrong and that high and worthy ideals must ultimately triumph, and he showed his faith by his works.

He was an indefatigable worker, never sparing himself in the service of the college or of the larger public, and he inspired his associates with the like zeal. It has been a common remark of newcomers that State College is an exceedingly busy place. It is true, and the secret was in the leader who said, not "go" but "come." Firm in maintaining the just prerogatives of his office, he was most generous in acknowledging the labor of others and was notably free from that petty vanity which seeks to absorb all the credit for progress and which speaks of "my" college, "my" faculty, "my" board. His ideal was the life of service, and the career of this gifted man must ever put before the students of State a high ideal of what constitutes success in life.

During his later years his multifarious activities overtaxed even his strong physique. Twice leave of absence was almost forced upon him by the trustees. Returning on each occasion from a European trip, he threw himself unreservedly—I had almost said recklessly—into his work again. Nearly a year before his death he suffered a severe attack of a bronchial disorder, and in the fall of 1905 he insisted upon presenting his resignation, to take effect as soon as his successor should be secured, and on the advice of his physician spent the winter in southern California. In the spring he returned somewhat improved and attempted to take up his work again. A business trip to New York and Washington in the uncertain weather of early spring, however, brought on a relapse, and for two weeks his life was despaired of. Later he rallied, and on commencement day was able to appear upon the platform and confer the degrees upon the graduating class. This was his last official act. He gradually grew weaker, and on July 24 passed quietly and peacefully away.

He rests on the campus of the college which he loved so well and to which he literally gave his life. Over his grave might well be written the epitaph upon Sir Christopher Wren in St. Paul's Cathedral, London, which I have often heard him quote, "*Si monumentum quaeris, circumspice*"—if thou seekest his monument look about thee.

J. K. PATTERSON, of Kentucky. It is with no ordinary feelings of regret and of sorrow that we commemorate and place on our records the high esteem and regard which we entertained for our late associate and friend, Dr. George W. Atherton, of the State College of Pennsylvania.

Descended from a vigorous and honorable New England stock, his education was obtained and his degree taken in one of the colleges of his native State, which has given to his Commonwealth and to the nation so many men who have achieved reputations for themselves and distinction for their country. A career of usefulness in civil life lay before him when the call to arms summoned him to the field in defense of the integrity of the nation. During his brief service—a service cut short by an illness which rendered him unfit for further military duty—he had already attained his rank of captain, retiring with an honorable record.

Fortunately for the new departure in education, partly determined by the Morrill legislation of 1862, Doctor Atherton early became interested in the movement, and thenceforward devoted his life to its development. With two or three able cooperators and lifelong friends, he both stimulated and controlled the mighty onward impulse which found expression in the land-grant colleges and universities of to-day. The Congressional legislation subsequent

to 1862 in behalf of these institutions was greatly influenced and largely shaped by him. He was one of the pioneers who brought this association into being. Few of us now remain who witnessed its birth. But we well remember the untiring energy, the vigorous initiative, and his indefatigable service, which, ungrudgingly given, gave it an auspicious beginning, and carried it forward to a rational and well-ordered maturity. The constitution, original and modified, under which it lives and energizes, is the product of his genius for organization. Whatever success this organization has achieved is due in large degree to the impetus of his intellect and his will.

Doctor Atherton wielded an uncommon influence with public men in the halls of legislation. Leaders in the Senate and leaders in the House gave him a willing audience, and were won by his quiet, dignified, persuasive presentation of his views. For years he was the chief representative of this body before the law-making power, and in this capacity his tact and wisdom and discretion never failed him.

Be it therefore,

Resolved, That we place in the minutes of this body our admiration of his gifts and of his virtues, our gratitude for his long life of devotion to human progress, and our high estimate of the services rendered by him to liberal, industrial, technical, and professional education.

In all the relations of life, moreover, he was a man and a gentleman. Envy and meanness were foreign to his composition. Candor, perfect fairness, integrity, charity, high ideals of duty and of honor, dominated his being and were conspicuous always and everywhere. A pleasing personality and a faultless grace of demeanor and expression revealed the excellence of the soul within. Where shall we find his equal? When shall we behold his like again? Let us revere his memory and imitate his example.

The resolution was adopted by a rising vote of the convention.

MEMORIAL TO HENRY CULLEN ADAMS.

W. A. Henry, of Wisconsin, read the following memorial upon the life of Henry Cullen Adams:

Henry Cullen Adams was born in Verona, Oneida County, N. Y., November 28, 1850, and came with his parents to Wisconsin the following year. In his veins flowed the blood of the statesmen Adams and Webster.

He received his education at Albion Academy and the University of Wisconsin; later he engaged in dairying and fruit growing. In 1883 he was elected a member of the State assembly and reelected in 1885. From 1887 to 1889 he was actively engaged in the work of the Wisconsin farmers' institutes. He served as president of the Wisconsin State Dairymen's Association and as secretary of the State Horticultural Society. He was appointed superintendent of public property in 1888, and from 1895 to 1902 was State dairy and food commissioner. In this last position he accomplished a great work for the dairy and pure food interests, and secured a training which later on proved eminently useful to the whole nation.

My acquaintance with Mr. Adams covered twenty-six years, during which time we lived as close neighbors. Knowing him intimately, I early came to know that his one burning ambition was to serve in the halls of Congress, not merely for the honor, but for the opportunity it gave to help on the cause of agriculture and to serve the common people. It was the opportunity and not the honor that attracted him and held him true to that purpose through many years of waiting and splendid preparation.

Fortunate indeed is the man who, born with ability, acquires the proper preparation and at last finds opportunity for the full exercise of all his powers in some exalted position.

Mr. Adams's extensive public service was a fitting prelude to his successful, though brief, career in Congress. He was a speaker of unusual power, expressing his thoughts logically and clothing them with the fewest, simplest words possible, always fitly chosen. He never repeated, and his telling sentences, often

of a few words only, followed one another with surprising rapidity and splendid arrangement. In debate, where he especially shone, he accorded his opponents the most courteous treatment. No matter how strained the contest, there was never any personal reference on his part. He regarded his opponent as his equal in honesty of purpose. These high qualities were early brought into prominence in his advocacy of the experiment station bill and attracted the attention of the Members of the House of Representatives. Probably no man who ever entered that deliberative body gained friends more rapidly than did Henry Cullen Adams. The rush of pregnant events pushed him into prominence, and his short Congressional career was a continuous triumph.

What we now know as the Adams bill had its inception in a conference held in the Capitol, Washington, about November 20, 1903, in which there were present Mr. Adams, Henry Casson, formerly secretary of state of Wisconsin, and then, as now, Sergeant-at-Arms of the House of Representatives, and myself. The Association of Agricultural Colleges and Experiment Stations had just closed its seventeenth annual convention in Washington. I had been in attendance, but was unable to return to my home on account of illness, and was lingering in Washington. It was during this sojourn that I made my way to the Capitol building and there had a conference with Messrs. Adams and Casson in which I told them of the dire poverty of our experiment stations, pointing out how the original Hatch Act gift had accomplished a vast deal of good and had made friends without number—how there was need for more agricultural research, which could not be undertaken with our present funds, and closed by telling them that our experiment stations needed another gift like that which came through the Hatch Act. Mr. Adams grasped the situation at once and closed our conference by saying: "Another grant to the stations would be a righteous measure. Congress will pass such a bill. It can be done."

As stated above, this conference took place about November 20, 1903. On December 4, about two weeks later, he wrote me, among other matters: "I firmly believe that a bill, such as outlined in our conversation, can be passed."

On December 11 he wrote: "Yesterday Doctor True, of the Office of Experiment Stations, called on me at the Capitol. I had a little talk with him in reference to the legislation that you and I discussed. I requested him to give the matter of form and details of the bill some thought, and agreed to call and see him later and go over the matter with him fully."

On December 24 he wrote: "I inclose herewith copy of a bill making an annual appropriation for the experiment stations. * * * I have gone over this subject with Dr. A. C. True, of the Office of Experiment Stations, and the inclosed bill embodies his idea of what the bill should be. * * * Write me at once what you think about this, as I wish to introduce the bill immediately after the holidays." Then follows one of his characteristic sentences: "I am alone in my glory here now, and am having plenty of time to work, while the statesmen are eating their Christmas turkeys at home."

On January 23, 1904, Mr. Adams wrote: "I called upon the executive committee of your national association the other day and was very warmly received by the gentlemen composing the committee. They were very enthusiastic over the bill and pledged me their vigorous cooperation, saying that they would act upon any suggestion I might make. Naturally I made some. Later they called upon me in a body at the House with a corrected copy of the bill, suggesting only minor amendments which are obviously proper."

And so there came into existence a measure which will in time double the original Government grant for agricultural research, yielding annually some \$700,000. How the bill was received by station men, the agricultural press, and our farmer constituents generally is a matter well known to you all. How it dragged through the sessions of 1904 and 1905 is likewise history. Some of us, in our multiplicity of duties, at times forgot the bill, vital as it was to our stations, but not so with Mr. Adams. It was on his mind all the time.

I have a large volume of correspondence from Mr. Adams, which forms a most unique history of the progress of this measure from its inception until its passage. It is interesting matter, I assure you. Much of it can not, with propriety, become public now. Time clarifies all, and it is my purpose to leave these papers where they will be accessible to the future historian. When the history of pioneer agricultural progress in America is written, as some day it will be, this work will stand out as a splendid example of what can be accomplished by one man in Congress, who has a righteous cause, a willing heart, a clear head, and a determined mind.

We are told that nothing of value comes easily in this world. The "Adams

bill," as it was called from the first, met no outward opposition: indeed, every Member he approached expressed the most cordial good will and promised support. But Congress was giving with a liberal hand to other projects. The St. Louis Exposition called for much; then there was the building of great battle ships, costing from five to eight millions each—a hundred millions a year for these alone. Under these conditions the Adams Act, which committed the Government to large and continuous appropriations, encountered strong opposition, and it required the exercise of great tact, patience, and knowledge of parliamentary procedure on the part of Mr. Adams to bring the matter to a vote; but one day in February, 1906, the bill was brought before the House under the rules and promptly passed without a dissenting vote. Its record in the Senate was the same, and on March 16 President Roosevelt approved the act by which the General Government will, in the future, set aside each year some \$700,000 for searching out new things to aid the great art of agriculture.

After the successful issue, he wrote: "Within a few hours after the passage of my bill, and beginning with your telegram, letters and telegrams of congratulation came in and have been coming ever since. It makes me feel pretty good."

Later he wrote: "Our bill went to the President last Thursday. I have been confined to the hotel nearly all the time since the date my bill passed the Senate. I am sufficiently thankful that I was able to keep on my feet for three months and a half, and get along with an endless amount of fighting, not to kick very much over being sick now. I shall be out in a day or two if nothing happens."

Mr. Adams had been more or less an invalid all his life. Sickness drove him from the State University before he completed his course; specter-like it haunted him in his every project. How he survived year after year, and accomplished the large amount of useful, lasting work he did, along so many lines, is a mystery to all who knew him intimately. How he wrought anything in the later years was a still greater mystery. He seemed to exist on will power, a splendid example of the supremacy of mind over matter. His ailment, ever etching at his frail body, made him thin and emaciated, but he only made light of this. At one time he wrote: "This matter is taking flesh off me at a rapid rate. I have actually lost a pound and a half in weight." He bore his affliction nearly always in absolute silence. Sometimes the muscles of the face would draw, the jaws set, and we knew that the harrow of pain was passing over him. Then, quick as the electric flash, there would come some bright, happy thought, not of himself, but of other men or things, and we who were with him were led to forget. Mind and body were out of balance. Mind was supreme.

All his life Mr. Adams was an optimist. He believed the world was growing better. This philosophy was the foundation of his success. He gave his friends new views of life and of the worth of living, and through his own splendid example how to accomplish much, despite the wearying drag of ever-present adversity.

The measures brought to issue in the first session of the Fifty-ninth Congress were among the most important and far-reaching ever considered by that august body. In this strenuous campaign Mr. Adams was in the very front of the battle. He studied the New Mexico-Arizona statehood problem on the ground itself, and early decided that the two Territories should not be forced into what he regarded as unnatural union, but the people left to decide, by vote, this question so momentous to them. This position was taken against the advice of many, and held despite a great pressure from those in high authority. Congress finally came to see this matter as did the "insurgents," with whom he was classed.

One of the most important pieces of legislation ever before Congress was the pure-food law. Here Mr. Adams's experience and knowledge, gained by his service as dairy and food commissioner of Wisconsin, served a splendid purpose. His familiarity with the subject, his judicious temperament, his generous nature in helping his friends, without stint, made his desk the rendezvous of the leaders in the movement.

All these events were slowly and surely sapping his small reserve of strength, though he held on with a persistence that surprised all. During this time his mental powers expanded rapidly. Opportunity and ambition brought forth full fruition.

And then at last, as though there had not already been enough, there came the herculean contest between the packers and the President over the meat-

inspection bill. The complications and differences grew and grew until there seemed no way of bringing harmony among the opposing factions and a termination to the acrimonious contest. Then it was that the qualities of our friend shone out as never before. By this time he had gained the universal confidence and regard of all the Members of the House, because of his broad knowledge and splendid judgment in these matters. They had come to know the man and placed their confidence in him. In an hour when the clashing interests were wrought to the highest pitch he aided materially in bringing the President and the packers together, and soon all was peace, and once more the people had won.

With the finish of the great Congressional drama, in which he had played such a conspicuous part, he left the Capital for his Wisconsin home, but it was too late, and on the way his light went out, our long-time friend had gone to join the great throng on the other shore. With his going there passed away one of the most useful men that had ever stood on the floor of Congress. Had he been spared to carry on the work he loved so well he would have advanced, in due time, to the chairmanship of the Agricultural Committee of the House. Here his great discernment, his broad powers, his intense love for agriculture, and his well-grounded sympathy with the common people would have made him an unequalled power for good in national legislation. As we enumerate the riches of his attainments during the three short years of his national public service I am sure we will agree that in the death of Henry Cullen Adams American agriculture lost the truest, wisest friend it ever had in the halls of Congress.

H. C. WHITE, of Georgia. Mr. President, by reason of my association with Mr. Adams as the representative of your executive committee, it may be proper and expected that I should say a word in connection with these memorial exercises. I have but a single thought to add to what Dean Henry has so eloquently and well expressed respecting the life and character and services of Mr. Adams. Mr. Adams deserves commemoration at the hands of this association, not only because of the successful legislation in our interest which he achieved, not only because of his sincerity of purpose in the endeavors which have benefited us, but also because he was indeed a great and worthy man. His characteristics have been referred to by Dean Henry, and were well known to all who came in close contact with him. There is one thing to which I wish to refer upon which Dean Henry has laid but little emphasis. He was a man absolutely devoid of the supercilious pride of personal opinion. He was a man who was perfectly willing at all times to subordinate his opinions to those of others. When the bill in which he was interested, and which he drew with great care and deliberation, was submitted to the executive committee of this association, before it was introduced into Congress, Mr. Adams asked for criticisms from the members of the committee. There were several features of the bill to which we saw objection. Mr. Adams, although he himself differed with the committee, had no hesitancy in striking those provisions from the bill. I have never known a man in public life who was so ready to submit his personal opinions to the opinions of others. I want to add this to what Dean Henry has said because it was to our minds one of the strongest characteristics of the man, one of his most admirable qualities, and one of his most valuable assets as a great statesman and a successful legislator.

A. C. TRUE, of the Office of Experiment Stations. I have listened with deep interest and entire approbation to the appreciative words that have been spoken concerning Mr. Adams. Those of us who were closely thrown with him during his Congressional career came to have the highest respect for him as a man. His personality was attractive. He had such a kindly, optimistic view of things, and you were so thoroughly impressed with his sincerity of purpose that you could not but have the deepest respect for him personally. We had come to feel that in him agriculture had a great leader in a broad sense, and that seems to me to be a very important matter. If you will look over the Congressional

Record you will find we have a considerable number of men who are interested in agricultural matters with reference to their own localities. The number of men who take a broad view of the agricultural interests of this country is small, so that in the loss of Mr. Adams, who was one of the men who took a broad view of our agricultural affairs, we have sustained an unusual loss. His place can not be easily filled.

The meeting then adjourned to meet again at 8 o'clock p. m.

EVENING SESSION, WEDNESDAY, NOVEMBER 14, 1906.

The session was called to order at 8.30 p. m., by Vice-President C. C. Thach, of Alabama, in Garig Hall, at the Louisiana State University.

ANNUAL ADDRESS OF THE PRESIDENT OF THE ASSOCIATION.

The chairman, C. C. Thach, introduced the president of the association, M. H. Buckham, of Vermont, who delivered the following address:

The most prominent events of the past year to us of the colleges and stations have been, first, the passage of the Adams bill, increasing the appropriation for the maintenance of the agricultural experiment stations, and second, the conspicuous success of the Graduate School of Agriculture in connection with the University of Illinois. The passage of the Adams bill with unanimity, and we may almost say with alacrity, in both Houses of Congress, means much for the institutions involved. It means an indorsement of and a faith in the work of the experiment stations, and virtually of the colleges which supervise them, as being of high and far-reaching practical value to the people, and it means that the Federal Government, on further reflection, deliberately adopts the principle and policy of Federal aid to scientific investigation in agriculture and related subjects, and to the diffusion of the benefits of such investigation among the people. Future steps must be forward in the same direction; to go backward or to halt is no longer possible. The stations will have no difficulty and will make no pause in putting to effective use their new revenue. Indeed, their imperative needs had already indicated the lines on which the new income will be utilized. The only drawback which accompanies the new outlook is the deep regret which we feel for the loss of the brave and resourceful man who carried the measure to success in Congress. Those of us who had the pleasure of personal contact with him recall with admiration his enthusiastic zeal, his vigor of utterance, and his serene assurance of final success in the enterprise he had undertaken; and in view of what he has accomplished for us at great cost of unrelenting and indomitable persistence amid discouragements and personal suffering, we all owe him and, I am sure, will gladly pay him, the respect and homage which will couple the name of Henry Cullen Adams, of Wisconsin, as a benefactor of agriculture, with the names of Justin S. Morrill, of Vermont, and William H. Hatch, of Missouri.

From all accounts received, we have reason to congratulate ourselves on the outcome of the second session of the Graduate School in agriculture held under the auspices of the University of Illinois, at Urbana. As regards the number in attendance, the high character of the courses and lectures given, the interest—approaching to enthusiasm—of the students, the publicity and prominence accorded to the meetings by the press and by the public, we may confidently claim that we have taken an important step in the progress of agricultural education. I venture to go further and to say that, while even after the brilliant promise of the Ohio college session the project was still an experiment of doubtful policy in the minds of many, we may now consider the Summer School of Advanced Science in Agriculture as a permanent institution. In confirmation of this statement it may be announced that the committee on graduate studies has already received an invitation to hold a session of the school in connection with a prominent university in 1908. The Graduate School has come to pass, it may be said, in the natural process of evolution. If graduate courses are called for in our universities in connection with all other branches of knowledge, why should not such courses be given in the several sciences relating to agriculture, a subject in which we have only just begun to see the possibilities, both theoretical and practical, of future investigation and research? Our

thanks are due to the authorities of the University of Illinois for the hospitality with which they have welcomed and the liberality with which they have sustained the Graduate School, and also to Doctor True for placing for a second time his matured judgment and executive capacity at the service of the school.

One of the most interesting chapters in the Report of the Office of Experiment Stations, just issued, is on "Progress in Agricultural Education," especially in other countries than our own. I beg leave to contribute to this most gratifying exhibit two items which may prove interesting. Our neighbor of the north, Canada, having for many years been doing excellent work with limited resources, has now had these resources largely augmented by the munificence of one of her citizens, Sir William McDonald, who has established a College of Agriculture near Montreal with the magnificent gift of a farm of 600 acres, buildings, and equipments thoroughly adequate to the needs of a first-class agricultural college, and an ample endowment, the whole reaching the sum of \$3,000,000. Not the least gratifying aspect of this gift is the example and commendation it gives of private munificence to a cause which has hitherto been almost entirely dependent on governmental patronage. At the great Aberdeen celebration, which gathered from all parts of the world men of science and of progress in unprecedented numbers, and which culminated in the dedication of a magnificent set of buildings to university pursuits, the King and Queen, representing, it is to be assumed, the general public estimate, selected for special inspection and favor the agricultural department of the university. When we remember that even trivial royal actions are studied parts of a matured policy, we may interpret this as the testimony of the intelligence of England to the value of scientific training in agriculture to the solution of the great question, a specially serious question in England, of feeding the people.

A convenient, though rough, working division of the common industries of the people is into agriculture and the mechanic arts. These, with the professions, in a general way, cover the field of human employments. Undoubtedly this was in Mr. Merrill's mind when he divided the instruction provided for in his bill into the two groups, "branches of learning relating to agriculture and the mechanic arts." But it seems to have been tacitly assumed that in this partnership, so to speak, agriculture was to be the predominant partner, and hence some of the colleges established under the act have styled themselves simply "agricultural colleges." But a careful study of the bill and of supplementary legislation shows no good reason for relatively minimizing to such an extent the department of the mechanic arts. As the colleges have developed under the free operation of educational and economic laws, the public demand and appreciation have very strongly expressed themselves in favor of a due attention to the mechanic arts. It is a fair question whether a more distinct recognition of this equality of rank and claim should not be given to the mechanic arts side of this dual status, not only in this association, where the claim has often been put forward without full response, but more effectively by corresponding patronage and an equal appropriation from the Federal Government. At all events, there would seem to be justice in asking the hitherto predominant partner, now that it has again received the bounty of the Government, to join with the friends of the mechanic arts in urging the national legislature to take one step toward equalizing the claims of the two great classes of industry, thus avoiding what might seem class legislation, by passing the Mondell bill now and for several years before Congress.

Turning now to the undergraduate side of our educational problem, let me ask your consideration of a subject suggested to us, and I believe urged upon our attention, by the moral crisis—I do not hesitate to call it—through which as a people we are passing. During the last quinquennial period in the United States we have witnessed a memorable public pronouncement on the supreme value of character. The expression of this judgment has come upon us with something of explosive energy. It has been customary for a long time past to say that the thing we care for most here in America is money; that we will overlook every defect and even pardon most faults and some crimes where we can see sufficient money. But we have somewhat suddenly found out that this is not true; that we have with false modesty been all along depreciating ourselves and belying our generation; that the thing we do most care for is not money; that there are things that no amount of money will pardon and things that no amount of money will buy; that the only way to have the good opinion of all the people all the time is to deserve it; that, in short, the only thing of permanent value in the universe, even in America, at any time, even in the twentieth century, is character.

If we look a little closely at this judgment we shall find that it is twofold—that, in the first place, it is a high appreciation of the human in life and, in the second place, that it is an exaltation of the right in life. Taking these points in reverse order we find that the temper of the times is to put emphasis upon the right. It is nothing new in the world that the wise and the good, the leaders and teachers of men, should assert that the one true way in life is the way of the right, and that all other ways are ways of mistake and failure and ruin. But the great mass of men in all the ages seem to have had a different philosophy of life from this. Whatever they may have approved in words, their conduct has seemed to show that they believed in something else than right as the better way for them—that the way to get out of life what it had for them was to act in obedience to a certain low prudence which seemed to them to promise success. And when they have seen success follow courses that were unrighteous, or less than righteous, they seem to have envied the success and approved the courses pursued. The moral history of mankind seems to show that men in general believe that to get certain things which all men desire, no matter by what means one gets them, is to get the good of life, and that in order to get these good things almost any means may be, if not justifiably, yet pardonably, used. But this was never really so. In their deeper hearts men never really believed that wrongdoing brings success. There has always been in the world a voice—legendary, lyric, dramatic, prophetic—a voice deeper than the lullaby of luxurious ease in sin, louder than the notes of plausible triumph, a voice of rebuke, of warning, of omen, of retribution. We hear it in the minor notes of the wail sounding in all folklore; we read it in the myths of the Eumenides; it startles us in the soft solemn tread of the Nemesis; it sits as black care behind the Epicurean horseman; it appears once and again as the “Mene, mene, tekel” of the prophet, as the sword of Damocles, the ghost of Banquo. It is always here and will not down. It abides with man, the testimony of his indefeasible divinity, the prophesy of his perfection. Every now and then, as at the present time, some great searchings of heart come to men, some surging uncovers the depths of our moral being, and we see things as they really and fundamentally are, and we see, as we are now seeing, that we have never really lost the moral standards of estimation; that we never really put the splendid dazzle above substantial merit; that we have been deceived and bewildered, but never totally debased and corrupted; that if we fostered and applauded crime in its place of might and power, in our hearts we honored and worshiped only truth and virtue and goodness.

And so the times are not in this respect depressing and ominous, but, on the whole, heartening and full of promise. It is good to be conscious of having attained a correct moral discernment, even if it come out of a great shock and turmoil. We ought to be thankful—we are, I am sure, thankful—that we have been brought to a sane judgment of what is and what is not worth while in the universe in which we live. We have seen, and it is one of the signs of the advancing kingdom of God in which prophet and saint exult—a new magnificat—we have seen the mighty put down from their seats and them of low degree exalted. If there is one judgment more pronounced and more decisive than any other of our times it is that the best thing in the world is not wealth, or applause, or office, or power, but character; that the persons to be envied and imitated are not czars, or millionaires, or sybarites, or “bosses,” but just, good, and true men and women.

The other element of character to which I have referred is the human element of it. If we divide the universe of our knowledge into men and things we have recently come to give men their due superiority over things, the human element in life its preeminence over the nonhuman. Not that we value nature less—it also is of the divine order and has everywhere the impress of the divine hand and the touch of the divine heart, but that it is of a lower order than man is God’s idea and should be our own. The oldest divine injunction to man is to have dominion over all nature, to keep it under him, and to exercise authority over it, to make it subservient to himself. When man makes himself the servant of nature, and he has often done it, when he devotes himself to the ministries whereby things are improved and material nature is made more effective and beautiful without any ulterior good to humanity, he has misused and wasted himself. He has cast pearls before swine. He has given that which is holy to the dogs. Is it unkind to say that in certain periods of history—and the last half of the nineteenth century was one of these times—that matter and force and natural law—that things visible and tangible absorbed relatively too much, that man, his capacities, and products, and institutions, and possi-

bilities, relatively too little of human thought and endeavor? Has there not been, is there not now, a balance to be restored, a readjustment to be made. I will not say between sense and soul, but between things of the intellect and things of the spirit, between nature and man? Is not the demand of the times becoming more and more a demand for the due recognition of the eternally human?

The pertinence of these reflections is in their bearing on the true function and aim of the college in our generation, and for us especially, the function of the Morrill colleges. I am not going to add another to the many discussions—tedious discussions they became long ago, I may say, who have had my share in them—over the general scope and contents of the educational programme provided by the Morrill Act of 1862. But I think the time has come when we are called upon to consider the question—not altogether new, and yet not tiresomely old in these gatherings—whether it is not our duty under the act, and our privilege and prerogative as educators, to give the education offered in these colleges a more decidedly humanistic turn than that which has hitherto prevailed in most of them, or at least so to magnify the cultural factors and intensify the humanistic spirit in our collegiate life that the general influence of this life on the collegiate body, and through it on the social life of our people, may be more liberalizing and vital. No one thinks that we have yet reached finality in determining the educational policy which our colleges should pursue. It need not be with excessive chagrin that we recall the crude attempts at college making which we and our contemporaries have gone through and left behind us. There is no more difficult service that wise men are called to undertake than to do laboriously this work, which so many have been ready to do *ex tempore*. It may yet be a long time before we are able to arrive at a definite educational policy for the Morrill colleges, if we ever do more than agree to allow such flexibility as will admit of a wholesome diversity and adaptation to varying circumstances and needs. If it shall prove to be the work of these colleges, whether as separate institutions or as parts of universities, to produce industrial experts, still it is to be hoped that these experts will differ from others by being liberally educated experts; that is, by having had that broader training, that introduction to and domiciliation in a more comprehensive intellectual life which we have thought involved in a liberal education. In taking this position I am not broaching any new idea. I am only echoing and formulating what a large and growing public intelligence is saying in the ears of us all. Men everywhere are inquiring for the cause of a certain moral and spiritual lack in our civilization—a lack which so easily becomes a lapse, even a collapse—and for a remedy adequate to meet the situation. It may be unjust to trace so large a share of this trouble to deficiencies in our scholastic and collegiate and ecclesiastical teaching, but it certainly becomes us to take the question seriously to heart and to search diligently for any remedial agency which may be within our reach.

Now, if we may make liberal use of the old term, now happily revived, "humanistic," to characterize a particular style or trend of education, may we hope to gain in the direction indicated by increasing the humanist emphasis in the "liberal education" which the Morrill Act requires in all the colleges?

When we ask if there are any studies which are necessities in a liberal education, which are so far obligatory that an education without them is not liberal, and, if so, what they are, I will confess that the list easily grows to formidable size. Look at them one by one for a moment. No one will dispute the statement that a liberal education must embrace an acquaintance with some other languages than our own, and that not merely for use in getting technical information, but for the purpose of learning how other men think, how they reason, and imagine, how they express themselves in oratory and song. Suppose, for example, that we were shut off from all direct communication with the gifted and cultivated people of the world, as we are shut off from the Chinese and Japanese, by ignorance of their languages, what intellectual privation and isolation would result! Now, when we have admitted that such knowledge of some languages is a necessity, we shall find it no easy task to exclude three or four languages—certainly not Latin, or French, or German. If I mention literature next, meaning by the term not what one reads in a recreative way, but what one studies in order that he may know mankind at its best—in its moods of elevation and inspiration—what a wealth of thought and life he misses who is not introduced to its charms and its potencies in the years when he is learning the possibilities of an intellectual life. If it be suggested that this lack can be made up by copious reading in after life, look around you

and ask how many readers of great and good books you see among the half educated. The same remark will apply to history. The desultory reading of history as we find it among ordinary readers has almost no educational value, whereas a good university course or series of courses in history is a valuable lesson in humanity, a teacher of law and liberty, of motive, of passion, and action, and the progress and development of human life in its various aspects, such as no other discipline can offer and no training can afford to dispense with. I shall allow political science and economics to plead for themselves, only calling attention to the wretched incompetency of many of our public men and public bodies in dealing with these subjects, owing to a lack of the fundamental scientific training in them, which, while it might not have conferred upon them the supreme wisdom which emergencies call for, would at least have preserved them from the woeful mistakes from which we are suffering and are likely to suffer. Surely no man could call an education liberal—that is, adequate for a free man and a maker of opinion and a source of action in a free State—which omitted a study of these essential elements of public well-being. If now the list should close with philosophy and ethics, and the half-educated man should question the claim to distinction of subjects so remote from real and everyday human needs as philosophy, the science of mind and thought and conduct, this would only serve to show that a so-called “practical” education would, from sheer obtuseness of vision, eliminate from its view the most truly human, the most profoundly practical, the most fruitful of good or of evil, according to its truth or error, of all human objects of study, and that on a liberal education, thus broadly conceived and wrought out, depends the vindication and exaltation of the nobler side of our human endowment and our possible development.

This brings us to the most difficult of all the questions of this group—the place of religion in a liberal education. The question is not the same as that which is distracting our British brethren, and which for centuries has hampered and retarded public education in almost all countries except our own. That question concerns children and youth in the secondary grades, who we think can be best dealt with, as regards religious training, in the homes and the churches. Our question relates to young men and young women, mostly away from home, and in our watch and care. We claim the control of almost their whole time and are responsible in a good measure for the subjects which mainly occupy their thoughts. If either parents or churches should seek to withdraw them from our control for any considerable time or for any absorbing occupation, we should resent the interference or bow to it only as a politic concession. And yet, when we seek to do anything for their religious nurture, we find ourselves amid such perplexities that we are practically doing little or nothing, and are vainly trying to quiet our consciences for acquiescing in a situation which we know to be illogical and which we hope will sometime be solved by a wisdom better than ours. Meanwhile, we see our institutions sending out a type of educated man well represented in Gallio in the Acts of the Apostles, “He cared for none of these things”—not atheistic, not actually hostile to religion, certainly not religious, negative and indifferent toward the whole subject, lacking in those qualities of charity and sweet reasonableness which nothing but religion can produce, often reappearing as teachers in the colleges to reproduce in their pupils a new generation of the same type as themselves. I fear it might truthfully be said that, while we carefully clear ourselves from the charge of teaching dogmatics and denominationalism we are laying ourselves open to the charge of teaching that manhood and womanhood may be complete without the religious element of character. But surely that is a conclusion from which we all shrink. What, eventually, will be the civilization which does not generate in its thinking and leading men that reverence for the divine side of human nature which is the guardian and inspiration of all the rest?

If it be said, as it may well be, that no one has a right to lay bare and aggravate a situation which is already perplexing and painful enough, without proposing, at least, something palliative, even if not remedial, I can only suggest that we might make much more than we do, of some departments of religion as a humanistic discipline—the historic, philosophic, literary, esthetic aspects of it. History has its necessary affiliations with religion. It is impossible to teach history adequately—I will say it is impossible to teach history honestly—without giving a large place to the history of religion, and we have found that almost all subjects are taught most effectively when they are taught his-

torically. A professor of high rank in one of our leading colleges complains that a most valuable aid to literary appreciation has gone out of this generation of young men with their diminished acquaintance with the English Bible. It is safe to say that any college whose students are losing the culture which comes from hearing the English Bible read in connection with daily worship is withholding from them a discipline in lofty sentiments, noble thinking, and beautiful utterance which no other training can supply. But the great field for the humanistic teaching of religion is in ethics, a subject which may well call for the services of our ripest scholars and most inspiring teachers, and which, without any perversion of its aims or any usurpation of prerogative, may extend its domain far beyond the confines of any narrow code of mere conventional morality. If it be said that these suggestions open the way for teaching dogma by indirection, for ecclesiasticism in the guise of history, the answer might be that even these would be better than to teach irreligion or non-religion by exclusion. But the better answer would be that in our age and country the spirit of intellectual fairness will see to it that what is called "academic freedom" be compelled to recognize its obligations and bounds, so that we need not surround our academic chairs with suspicion and limitation.

The same line of thought may be extended into other departments. Let us go so far afield as to apply it to instruction in the military art. The requirement of the act of 1862, that the Morrill colleges give instruction in "military tactics," was in response to a supposed need of the times, which need, owing to the efficiency of the militia in practically all the States, has largely passed away. But the requirement remains and must be faithfully fulfilled. But without calling in the legal remedy "*cy près*" to meet changed conditions, why may we not carry out the spirit of the requirement without slavishly adhering to the "letter which killeth," by giving a humanistic turn to military studies?

The training now required by the War Department is, for the mass of students, that adapted to enlisted men, and has neither the technical merit of fitting men for their occupation in life—for these men are not fitting to be soldiers—nor that of imparting an intellectual discipline valuable in any calling, which no one would claim for the drill mainly in the manual of arms as now practiced. But the military art has always had and is likely long to have an intimate relation to the progress of civilization. It is impossible to understand the history of any nation—it is impossible to understand nationality itself, much more to understand international relations—without some knowledge of the science and art of war. We may go further and say that it is not possible without such knowledge for wise and good men to mitigate, abridge, prevent, and finally abolish war and bring in the reign of universal peace. Here is a subject which may properly be classed as a university subject, a subject which has a place in an intellectual career, and is worthy the thought and study of every educated man, a study which should include military tactics and strategy so far as to enable one to understand campaigns, battles, sieges, fortifications, ordnance, etc., and which would be affiliated with history, international law, politics, and sociology, so as to be one of the broad, humanistic studies in a university man's preparation for a full and liberal life. If it is desirable to keep alive in the best part of the nation a jealous national pride and a watchful spirit against aggression, that spirit of vigilant repose which is not suspicious of danger, but which is prepared for it, this spirit can be much more effectively cultivated by the study of war in its historic and philosophic aspects than by devoting relatively so large a part of the time and effort to the securing of a kind of efficiency in drill which in actual practice is likely to be called upon seldom, if ever.

The great problem of the higher education now before us is how to integrate specialism with the totality of which it is a part. Since the German university idea got possession of the pedagogic mind in America we have been turning our education into somewhat narrow specialties, and the more advanced the studies the narrower becomes the field of operation. We have been pushing, so to speak, our bark, or our shallop, into the little creeks and rivulets, far up in the remoter regions of a subject, and have lost acquaintance with the ocean, which is at once the source and the outflow of all of the tributary streams. It has been the custom in some quarters to speak contemptuously of fresh-water colleges. The true university is one which, physically located either on the seaboard or among the mountains, commands a broad outlook on the great and wide sea of truth and humanity and deems nothing human alien to it. The time is coming, if it is not now here, when the institutions founded

under the act of 1862 will be brought into competition for public approval and patronage with the institutions which continue to offer under enlarged conditions a liberal—that is, a humanistic—education. On one side of the work committed to us, our fame, as Webster said, “is gathered and safe.” We are adding to the material wealth of the world and are providing the agencies and the men by which that wealth will be indefinitely increased. If an account is called for of acres under profitable cultivation, of ton-miles of transportation, of voltage in terms of light and heat and power, we could stand up and modestly bear the applause which would follow the audit. We have made, not two, but five blades of grass grow where but one grew before. Let us, without relaxing our aims and efforts in this direction, set before ourselves the higher task of improving the humanity of our people. Let us distinctly understand that, intrusted as we are with the education of a large portion of the people in “the several pursuits and professions in life,” it is our business to educate them in those liberal arts which make for the broadening and lifting and sweetening of life. For one I do not think that the possibilities of the Morrill Act can be best fulfilled by gradually converting them into universities for research. Let us, by all means, have such universities. But let the Morrill colleges abide by their true intent, and aim to combine technical instruction with the truly humanistic learning. A very significant and somewhat startling question was discussed at a recent meeting of the New England College Association, namely, “How can we prevent illiteracy in college graduates?” Let us add to the question, as the facts warrant us in adding, how can we prevent crudeness, narrowness, and one-ideanness in college graduates, the conceit which comes from limited knowledge, the hardness which comes from studying, things not too much but men not enough, the dryness and coldness which betray the lack of the ethical and religious elements of character. All who are responsible for the teaching force of an institution will agree that our greatest difficulty is in finding men who are interested in the personality of those whom they are to teach. It is easy enough to find teachers who are interested in their subjects, but the true work of a teacher is not to use his class as a means for his own progress in his subject, but his subject as a means for making men out of his pupils. The call of the country and of the times is for a type of educated man who shall be a combination of two sets of qualities which are difficult of combination, but not impossible, for with God all things are possible—the man who knows one subject thoroughly and the man who knows many subjects fundamentally. The Morrill college graduate should be one who knows well the essential principles of the subject he has chosen for his specialty and so much of the related, and especially the humanistic studies, as will introduce him into the large field of human life and make him a life-long student and an active participant in the total life of man.

The influence of a college upon its students depends largely upon what it emphasizes in its teaching and what it incarnates in the personality of its teachers. We are required by our fundamental law to put special emphasis upon certain pursuits and callings. But that should not debar us; it should rather encourage and stimulate us to put the strongest emphasis upon what in any and every educational institution is its main object and should be its highest ambition and satisfaction and glory, its human output.

MORNING SESSION, THURSDAY, NOVEMBER 15, 1906.

The session was called to order at 9.30 a. m., President M. H. Buckham presiding.

Brown Ayres, of Tennessee, in behalf of President Craighead, of Tulane University, extended a cordial invitation to the members of the association to visit that institution in New Orleans at the close of the convention.

On motion the invitation was accepted with thanks.

REPORT OF COMMITTEE ON INSTRUCTION IN AGRICULTURE.

A. C. True, of the Office of Experiment Stations, made the following report for the standing committee on instruction in agriculture:

The committee on instruction in agriculture was organized immediately after its appointment at the convention of 1905. On invitation of the committee, Mr. D. J. Crosby, of the Office of Experiment Stations, consented to act as secre-

tary. Subcommittees were appointed as follows: On secondary courses, A. C. True and T. F. Hunt; on courses in home economics, H. T. French and H. C. White; on courses in rural engineering, W. E. Stone and J. F. Duggar.

It was decided to adopt the plan of the previous committee as regards the making of an arrangement with the Office of Experiment Stations to prepare and publish a series of illustrative exercises, arranged and graded for use in courses in agriculture in elementary schools. Such a series covering the general principles of the subject of agronomy, as outlined in the ninth report of the committee on teaching agriculture,^a has been prepared in that Office, and it is hoped will be printed at an early day. This will be followed by similar publications covering other branches of agriculture.

The subcommittee on secondary courses decided to outline a syllabus of a course for use in the regular public high schools and to develop a series of lessons and practicums which would more fully show the character and scope of this course. The course as outlined is for the third and fourth years of a high school course and presupposes elementary instruction in botany, zoology (including physiology), and chemistry during the first two years of the course. This is in accordance with the plan for high school courses outlined by the committee on teaching agriculture in its seventh report.^b

In the preparation of the lessons and practicums for this secondary course the committee has had the assistance of Dr. G. F. Warren, an experienced high school teacher, who has recently been associated with Professor Hunt, at Cornell University. It is hoped that the syllabus and lessons covering the subject of agronomy can be published at an early day by the Office of Experiment Stations. The subcommittee will continue work along this line covering the other branches of agriculture.

The subcommittee on courses in rural engineering has confined its work thus far principally to ascertaining the existing status of such courses in the land-grant colleges and has submitted a brief report along this line.

The subcommittee on courses in home economics has also confined its work thus far to ascertaining the existing status of such courses in the land-grant colleges and has submitted a brief report along this line.

A. C. TRUE,
T. F. HUNT,
H. T. FRENCH,
H. C. WHITE,
J. F. DUGGAR,
W. E. STONE.
Committee.

REPORT OF SUBCOMMITTEE ON COLLEGE COURSES IN RURAL ENGINEERING.

This report is intended to do no more than indicate progress regarding instruction in rural engineering. It is believed that for the present it is best to give further study to the question before attempting to draw conclusions.

Of the forty-eight land-grant colleges at least thirty-two are offering some instruction which may be classified under the head of "Rural engineering." The amount and quality of this instruction varies widely, and the fact that this branch of agricultural education is at present in an extremely unsystematic and unpedagogic state is impressed by a study of the data at hand. There is no uniformity in the nomenclature of subjects taught and no common understanding as to their scope or application.

Under these conditions it is difficult to classify or to describe the present status of instruction in this field. It is at least evident, however, that there is a growing recognition of the importance of the subject, and that efforts are being made to bring it into more consistent and teachable form.

The field is wide when one includes the entire country, and the particular needs for instruction in different subjects will vary according to localities. For this reason each institution must in a way develop its own courses with reference to its own conditions. Since the entire subject is in a state of evolution, it is believed that the better plan will be for the colleges not to attempt too wide a range of work at the first, selecting rather a few subjects of prime importance to the given State or region, and attempting to do only as much as can be well done.

^a U. S. Dept. Agr., Office of Experiment Stations Circ. 60.

^b U. S. Dept. Agr., Office of Experiment Stations Circ. 49.

The dearth of competent instructors and of text-books renders it a matter of no small difficulty, from an administrative standpoint, to inaugurate and maintain such courses.

Nearly all of our institutions have developed courses in mechanic arts, with competent instructors. Probably it will be better at first to utilize the men and equipment of these departments in teaching the principles of rural engineering rather than to attempt to establish full-fledged separate departments. Land surveying, road construction, shop practice, drawing, the use of cement and concrete, mortars, and the principles of mechanics are elementary and fundamental to all engineering practice, and the student of agriculture does not require a special instructor in these any more than in mathematics or English or elementary chemistry.

On the other hand, the application of these principles to farm operations, equipment, drainage, irrigation, and construction may well be taught by instructors versed in this special branch of agriculture. It will be possible under this plan for colleges to give much valuable instruction in the elements of rural engineering without, at the beginning, the addition of new instructors or equipment, although as interest develops these will be necessary.

It is useless to attempt instruction in these subjects by class-room teaching alone. There must be laboratory practice and field work with commercial equipment, dealing with real problems.

Only a few institutions now have separate departments for giving instruction in rural engineering. Two or three have buildings specially designed and equipped for the work. At the other extreme are those institutions which give only a minimum of class-room instruction in one or two subjects.

Existing practice has developed sufficiently to indicate at least what are some of the more important subjects for instruction. These may be taken as the basis of projected courses, although it is doubtful if any given institution would care to give first rank to all. Some of these subjects are fundamental, others distinctly of special significance. They may be enumerated as follows:

(1) Shop practice, (2) surveying, (3) drawing, (4) layout of the farm, (5) farm buildings and fences, (6) water system, (7) irrigation, (8) drainage, (9) road construction, (10) farm mechanics and machinery.

Rural engineering has an incidental and a supplementary place in the general college course in agriculture. It should not occupy time and place to the exclusion of subjects of more general application, included in agronomy, animal husbandary, dairying, and horticulture.

On the other hand, rural engineering, as a preparation for a career or a profession, consists in the application of fundamental engineering principles, and should be approached through a thorough and careful engineering training upon which the application to farming operations, materials, and machines is finally developed.

The following table shows the extent to which rural engineering subjects are now taught in the land-grant colleges, so far as information has been available. The figures state the number of institutions giving the respective courses as required or elective in courses in agriculture.

Number of land-grant colleges giving the rural engineering subjects named.

Subject.	Required.	Elective.	Total.
Farm mechanics	20	7	27
Farm buildings	15	9	24
Surveying	17	5	22
Road construction	12	6	18
Fence construction	7	4	11
Shop practice	19	5	24
Drawing	15	1	16
Drainage	15	6	21
Cement work	5		5
Irrigation	5		5

Additional study will be required before a detailed syllabus for courses in rural engineering can be outlined.

W. E. STONE.
J. F. DUGGAR,
Subcommittee.

REPORT OF SUBCOMMITTEE ON INSTRUCTION IN DOMESTIC SCIENCE.

H. T. French, of Idaho, submitted a brief preliminary report for the subcommittee on this subject, summarizing information regarding titles of domestic science courses in the land-grant colleges, length of the courses, number of teachers employed, and students enrolled, obtained in response to a circular letter of inquiry sent to the various colleges. The report was based upon 22 replies to this circular letter. These showed great lack of uniformity in the titles of the courses corresponding with a variation in the character of the courses themselves. It was made evident that much attention is being given to the arranging of courses in domestic science in the agricultural colleges and that there is great need of an ideal or a standard course to serve as a guide in the organization of such instruction.

REPORT OF COMMITTEE ON GRADUATE STUDY—GRADUATE SCHOOL OF AGRICULTURE AT THE UNIVERSITY OF ILLINOIS, 1906.

L. H. Bailey, of New York, presented the following report of the standing committee on this subject:

The work of your committee on graduate study has been confined to the holding of the Graduate School of Agriculture at the University of Illinois. The Graduate School of Agriculture is an institution of this Association of American Agricultural Colleges and Experiment Stations. It is an agency whereby the association aims to perform a piece of constructive work that shall have a definite and lasting influence on education. The committee desires briefly to outline the purpose and the character of this work.

Purpose.—This graduate work stands for a kind of teaching that lies beyond the college grade and that makes strongly for originality and personality. This enterprise expresses the conviction of the association that agricultural subjects are as capable as any others of advanced study, that they have equal and similar pedagogical value, and that there is need of the pursuit of them. The colleges of agriculture have scarcely yet entered the sphere of graduate work. The probability is that what little work there is of this kind is graduate mostly in name rather than in substance. This association stands for good public policy in rural affairs, good progress in research work, and good accomplishments in collegiate educational work. It now stands also for the completing of its opportunity and purpose in the establishing and defining of postgraduate teaching. There are perhaps four epochs in educational training, each requiring somewhere near four years more or less—primary, secondary, collegiate, post-graduate or university.

In agricultural education the third or collegiate epoch is now well developed. The system is yet both footless and headless. If this association is to concern itself with colleges and research, it can not escape the responsibility of furthering post-graduate work, or of dignifying it.

The unqualified success of the second session of the graduate school established the fact that graduate work is in demand. This school is now the only meeting ground for teachers and investigators in agriculture. The comradeship of it is itself worth the while.

Yet only about half the agricultural colleges sent students, indicating either that the need of the postgraduate work is not yet generally felt or that there is lack of confidence in this particular kind of effort. The experience with the two sessions of the graduate school indicates that no agricultural college or experiment station can afford not to partake in it if the institution expects to keep in living touch with the knowledge and opinions of the day. With the great and increasing demand for trained men the work of the graduate school in aiding to fit them becomes of a special importance.

It is also of great advantage to any State to have a graduate school held within its limits, because it challenges attention and raises questions and sets ideals. It is equally true that nothing will more surely vitalize the college at which it is held. The Graduate School of Agriculture is blocking out new lines of pedagogical work.

Character of the work.—The work of the school should be really postgraduate. The association, therefore, should exercise discrimination as to where the school shall be held. The meeting place is not to be chosen as a courtesy to any institution.

Postgraduate work is personal work founded on investigation. The teacher must prepare for it consciously during at least one year in advance, to be able

to bring to the school new results and fresh enthusiasm. Therefore, the next school should be located now and the faculty chosen at once.

It should be a matter of both pride and duty for any teacher to accept a place in the faculty of the graduate school. The older and experienced men owe it to the younger ones to give a serious summer to this work now and then. Much of the poise and inspiration of the school comes from the presence of men who have attained to years and positions of influence. There have not been enough of these men at the two sessions of the graduate school.

If graduate work is personal work then there should be a very small ratio between the number of teachers and the number of students; that is to say, the number of teachers should be large. The value of graduate work lies not so much in the subjects that are announced as in the men that are announced. The student should be allowed liberal choice of his men.

Details of the last school.—The details of the organization, courses of instruction, and incidental features of the second session of the Graduate School of Agriculture are given in the supplementary records, which the committee submits herewith. The committee recommends that the report of the dean and registrar, together with all the accompanying papers, be published in pamphlet form, as a history and record of the movement of this time. The committee feels that the graduate school undertaking is the beginning of a movement that will have great significance in years to come. The committee wishes to express its feeling of gratitude to the many persons who have cooperated in the work, and especially to the dean, Dr. A. C. True, for much painstaking devotion, and to the registrar, Director Eugene Davenport, for untiring attention to the enterprise. The association is under special obligations to the University of Illinois for its liberal and whole-hearted cooperation in furtherance of the work of the school.

Finances.—The graduate school is supported by three classes of funds: (1) The fees of matriculation (fixed at \$10 for the second session); (2) contributions from agricultural colleges and separate experiment stations; and (3) the contributions of the holding institution, comprising the remainder of the expenditure.

The fees collected at the session last summer amounted to \$710.

The association at its Des Moines meeting authorized the committee to request a contribution of \$25 from its different institutions, to aid in support of the graduate school. The two contributions from each institution are supposed to go to the support of the succeeding school; therefore, the date at which the contributions are due is assumed by the committee to be July 1, in each year, as that is the approximate date of the holding of the school. For the year ending July 1, 1905, contributions were received from 22 different institutions (\$550). For the year ending July 1, 1906 (as collected up to November 1), contributions were received from 16 institutions (\$400). This makes a total contribution of \$950, from which is to be deducted \$127.48 for traveling expenses of the graduate committee.

The total expenses of holding the second session of the graduate school was \$3,168.15, as appears in detail in record No. 2, submitted herewith. Deducting the available receipts leaves a net balance standing against the University of Illinois of \$1,635.63. This will be somewhat reduced by contributions still unpaid.

Records.^a—The committee herewith submits five sets of records, as follows:

1. Register of the members of the second session of the Graduate School of Agriculture, July, 1906. This shows a total enrollment of 131 persons, as against 75 persons in the first session, 1902.
2. Financial statement of the second session.
3. Circulars, programmes, and other printed matter of the second session.
4. A report of the dean and registrar of the second session.
5. Address of Doctor True on the history and aims of the Graduate School of Agriculture.

Recommendations.—The committee makes the following recommendations:

(1) The association should determine whether the institutions that invite the school are really manned and equipped for postgraduate work. That is to say, its committee on graduate study should not accept an invitation merely as a courtesy to any institution, but should exercise discrimination.

(2) The next school should be located now, and the faculty chosen at once.

^a The records of the graduate school are filed in the Office of Experiment Stations.

(3) That the reports of the dean and registrar, together with all accompanying papers, be published in pamphlet form as a history of the movement.

(4) That the contributions of \$25 be continued and that the date at which they are due be assumed to be July 1 in each year.

L. H. BAILEY,
H. P. ARMSEY,
M. H. BUCKHAM,
W. O. THOMPSON,
BROWN AYRES,
R. H. JESSE,

Committee.

The report, with its recommendations, was adopted.

REPORT ON THE SECOND SESSION OF THE GRADUATE SCHOOL OF AGRICULTURE.

On the invitation of the committee on graduate study of the Association of the American Agricultural Colleges and Experiment Stations the undersigned accepted the offices of dean and registrar, respectively, for a second session of the Graduate School of Agriculture, to be held at the University of Illinois in the summer of 1906. The committee acted promptly after the adjournment of the Washington convention of the association, November 16, 1905, by accepting the invitation of the president and trustees of the University of Illinois to hold the second session of this school at that institution, but some delay in making definite arrangements for the school was caused by uncertainty regarding the time of holding the next annual convention of the association inasmuch as the association had voted to hold its next convention in California, and it was felt that the school and the convention should not be held at conflicting dates. Before this matter was finally decided the dean and registrar had a preliminary consultation at Urbana January 4, 1906, at which time a tentative plan was made for courses of instruction and for conducting the business of the school. It was agreed that the duties of dean and registrar, respectively, should be substantially the same as these officers had performed in connection with the first session of the school. The dean was to organize the faculty and make arrangements with its members for the work which they should individually undertake, and the registrar was to conduct the correspondence and other business relating to membership in the school and make the necessary local arrangements for the housing of the school, laboratory, and other facilities, board and lodging of the faculty and students while in attendance, etc.

A decision having been reached that the second session of the school should cover the four weeks from July 2 to July 28, 1906, the following preliminary programme for the session was submitted by the dean to the committee on graduate study early in February, 1906.

This plan having been approved by the committee, correspondence with proposed members of the faculty was at once begun by the dean.

Greater difficulty was experienced than in connection with the first session in securing the consent of persons invited to become members of the faculty. This was not due to any unwillingness to serve the school or lack of interest in its success, but to the interference of other duties or to other uncontrollable causes. It is clear that within the past few years the burdens of our leading agricultural teachers and investigators have greatly increased. After the faculty was formed there were more withdrawals than in 1902, caused almost without exception by ill health.

Announcements of the school were made by the registrar as follows:

Postal card, February 3, 2,000 copies; preliminary programme, February 20, 2,000 copies; prospectus, April 18, 3,000 copies; programme, June 1, 3,000 copies. Copies of these announcements are submitted herewith. These were sent to agricultural colleges and station officers in all the States and Territories (600), farmers' institute lecturers (540), officers of the U. S. Department of Agriculture (200), graduates of college of agriculture of University of Illinois (150), and miscellaneous applicants. Copies of prospectus and programme were also sent to each dean and director in packages of 10 for distribution among the graduates of his college. In each instance the package was accompanied by a letter stating that additional copies could be supplied upon request. A number of such requests were received and filled.

Announcements were also published in the Experiment Station Record, Science, and other journals, and copies were sent to the agricultural press.

The university authorities put at the disposal of the school the large and well-appointed Agricultural Building, which contains lecture rooms and offices, thoroughly equipped laboratories, and an assembly hall. The other buildings

of the university, its library, and the farm of 600 acres, with its animals, experimental fields, etc., were freely opened to the inspection and use of the school. A stenographer was provided for the use of the dean, registrar, and members of the school. Arrangements for board and lodging were made in the neighborhood of the university for from \$6 to \$7 per week. Members of the faculty were assigned to places for board and lodging, and payment was made in lump sums by an officer of the university on behalf of the school.

The faculty included 35 men, of whom 5 were leading officers of the U. S. Department of Agriculture, 12 were members of the faculty of the college of agriculture of the University of Illinois, and 18 were professors or experts from 16 other agricultural colleges and experiment stations. There were also 12 men who gave one or two lectures or addresses. In addition to these the school was attended by 91 men, who may be classed as students. Seventy-one persons paid the matriculation fee. In accordance with the instructions of the committee, no fee was required of any member of the Illinois College faculty, in consideration of the fact that honorariums were not received by members of this faculty who lectured at the school. The total enrolled membership was 131 from 34 States and Territories and the District of Columbia. Hungary was also represented by the professor of agricultural chemistry of the University of Budapest, and there were 3 students from India. There were also a considerable number of persons not registered who attended one or more lectures as visitors.

The second session of the school opened promptly at 8 a. m. July 2, 1906, and continued four weeks.

The instructors and subjects in the several courses were as follows:

AGRONOMY.

Jeremiah G. Mosier, B. S.

Soil physics in practical agriculture. One lecture.

Cyril G. Hopkins, Ph. D.

Methods of investigation relating to soil fertility. Interpretation of results.

Soils deficient in nitrogen, in phosphorus, in potassium.

Application and liberation of plant food—direct and indirect effects.

Possible systems of permanent agriculture, with maximum and minimum crop yields.

Edward B. Voorhees, D. Sc.

The rôle of fertilizers in soil fertility. Five lectures.

H. J. Wheeler, Ph. D.

Lime and magnesia in their relation to soils and plant growth. Two lectures.

Soda and potash in their mutual relations to soils and plant growth and to the ash constituents. Two lectures.

Certain phosphates in their relations to soils and plant growth. One lecture.

Jacob G. Lipman, Ph. D.

Soil bacteriology in its general relation to crop production.

The chemical phases of decay involved in the transformation of organic and inorganic constituents in the soil.

Oxidation processes in the soil: The formation of nitrites and nitrates.

Deoxidation processes in the soil: Denitrification.

Bacterial synthesis of nitrogenous compounds: The fixation of atmospheric nitrogen.

A. N. Hume, M. S.

Field crops. Two lectures.

Mark A. Carleton, M. S.

Field crops. Three lectures.

Charles W. Burkett, Ph. D.

Grasses and forage plants for the South. Methods of teaching. Five lectures.

William J. Spillman, M. S.

Types of cropping systems. Two lectures.

Relation of types of farming to fertility. One lecture.

Distribution of grasses and forage plants. One lecture.

T. Lyttleton Lyon, Ph. D.

Modifications in growth, structure, yield, and composition of certain crops under different conditions of soil and climate. Five lectures.

ZOOTECCHNY.

- Whitman H. Jordan, D. S.
Principles of nutrition. Five lectures.
- Henry P. Armsby, Ph. D., LL. D.
Feeding for meat production. Five lectures.
- Henry J. Waters, B. S. A.
The profitable use of protein in the production of beef. Two lectures.
Limitations in baby beef production. Two lectures.
The influence of condition upon the rate and cost of gain. One lecture.
- Charles F. Curtiss, M. S. Agr.
Perfection of finishing. Five lectures.
- Herbert W. Mumford, B. S.
Economic interpretation of data secured in feeding experiments. Five lectures.
- Robert S. Shaw, B. S. A.
Northern cattle production. Five lectures.
- W. J. Fraser, M. S.
Dairy husbandry. One lecture.
- W. Dietrich, M. S.
Swine husbandry. Two lectures.
- Charles S. Plumb, B. S.
The live-stock market.
Cattle judging.
Animal-husbandry thesis.
Use of the library.
The herd book and its uses.
- M. F. Horine.
Theo. Closz.
J. J. Ferguson.
The packing and marketing of meat.

HORTICULTURE, PLANT PHYSIOLOGY, AND PATHOLOGY.

HORTICULTURE.

- Spencer A. Beach, M. S. A.
Systematic pomology. Two lectures.
The apple.
Horticultural records.
- Joseph C. Blair.
The present status of horticulture in the Central West.
The cold-storage problem.
- John W. Lloyd, M. S. A.
Investigations regarding factors influencing the earliness of yield and quality of muskmelons.
- Charles S. Crandall, M. S.
The conduct of an experiment.
Making records.
- U. P. Hedrick, M. S.
Factors governing the adaptations of fruits.
The formation of fruit buds.
Orchard ecology.
The influence of weather on setting of fruits.
The needs of horticultural experimentation.
Methods in experimentation and economics in horticulture.
- John Craig, M. S.
Pruning orchard fruits.
The grape.
The present status of horticulture in the eastern United States.
Fruit bud development.

PLANT PHYSIOLOGY.

- George E. Stone, Ph. D.
Electricity and plant growth. Two lectures.
Physiology and pathology of shade trees. One lecture.
Physiological and pathological troubles in greenhouses. Two lectures.
- Charles F. Hottes, Ph. D.
Plant physiology—demonstration lectures and discussion of methods.
Three lectures.

PLANT PATHOLOGY.

Thomas J. Burrill, Ph. D., LL. D.

Plant diseases: Characteristics and methods of investigation. Two lectures.

Merton B. Waite, B. S.

Diseases of orchard fruits with special reference to different types of diseases affecting apples, pears, and other fruits. Five lectures.

Lewis R. Jones, Ph. D.

Potato diseases, including relations of development of the potato to susceptibility, disease resistance, etc. Five lectures.

PLANT AND ANIMAL BREEDING.

Herbert J. Webber, Ph. D.

The history and primary factors of plant breeding.

The causes and kinds of variations and their importance to the breeder.

The improvement of plants by selection.

The theories and laws of hybrids and their importance in practical breeding work.

The use of hybridization in practical plant breeding.

Nels E. Hansen, M. S.

De Candolle's law of hardiness in prairie horticulture.

Travels and studies in America, Europe, and Asia.

Work with orchard and small fruits.

Laws and methods of producing variation.

Present status of and prospects for prairie fruit breeding.

Eugene Davenport, M. Agr.

Variation and type.

The mathematical nature of descent.

Regression and the regression table.

Correlation and coefficient of heredity.

Henry L. Rietz, Ph. D.

Statistical methods applied to problems in breeding.

General character of arguments based upon statistics.

George M. Rommel, B. S. A.

Some pressing problems in animal breeding. Three lectures.

David Castleman, major, U. S. A.

Breeding saddle horses.

C. D. Woods, Sc. D.

Breeding hens for egg production.

N. H. Gentry.

Breeding Berkshire hogs.

Public exercises were held on the evening of July 4 when the school was welcomed to the university by Dr. T. J. Burrill, vice-president of the university. Prof. L. H. Bailey presided and made an address in which he pointed out the need of a comprehensive system of agricultural education comprising institutions or departments for research, graduate study, college courses, extension work and secondary and elementary courses. The graduate school is needed to aid in the more complete establishment of such a system and to stimulate workers in our agricultural institutions to more thorough study and research. Dr. A. C. True gave a short history of the graduate school and pointed out the great development of agricultural education and research in this country since the first session of the school was held at Columbus, Ohio, four years ago. He also called attention to the pressing need for more trained workers in different branches of agricultural service. The claim was made that the battle for adequate recognition of agriculture in our higher institutions of learning is essentially won and that our leading educators are convinced that agriculture in some form should form a part of the industrial element of public school education. It was pointed out that so great is the public interest in agricultural education and research that funds are coming to our agricultural institutions fully as fast as they can be utilized and that a very great responsibility is being laid on our agricultural teachers and scientists to make the best use of the money put in their hands. A paper by Dr. H. W. Wiley, Chief of the Bureau of Chemistry, was also presented, in which the meager opportunities for study along agricultural lines in preparation for the doctor's degree at our leading

universities were shown and contrasted with the wider opportunities for such work offered in the German universities.

A conference for the discussion of general questions relating to the organization of agricultural education and research was held July 7. Dean Davenport outlined the organization of the College of Agriculture of the University of Illinois. The system followed there involves the division of authority and work in such a manner that definite responsibility is laid on officers in the several departments and full credit is given for each man's share in the work. Questions involving "team work" are discussed at meetings of the workers, and every effort is made to secure full agreement on plans before their execution is attempted. It is assumed that responsibility for progress in the various agricultural lines lies fundamentally with the associations of farmers representing these interests, e. g., animal husbandry and horticulture. This insures not only interest in college and station work on the part of these organizations, but it also secures financial and moral support of the leading and presumably the more progressive farmers of the State, not as individuals, but in an organized capacity.

Professor Bailey argued in favor of the establishment of regular provision for agricultural studies leading to the doctor's degree in our universities, and would make this a matter to be controlled by the university rather than by the college of agriculture. He also favored the simplification of degrees and would have Ph. D., M. S., and B. S. (or M. A. and B. S.) the only degrees to be conferred in course. This suggestion met with much approval from members of the graduate school.

Dr. W. H. Jordan, director of the New York State Experiment Station, spoke very earnestly of the need of more thorough scientific research along agricultural lines and impressed his hearers with the great importance of maintaining the strictest integrity in making and recording agricultural investigations.

Dr. W. O. Thompson, president of the Ohio State University and one of the founders of the graduate school, gave a brief account of the origin of the school and expressed his strong belief in its value as an aid to broadening and strengthening our system of agricultural education. He predicted that it would have a career of increasing success and usefulness.

Dr. Brown Ayres, president of the University of Tennessee, spoke from the standpoint of one interested in general educational advancement and emphasized the importance of the movement for the development of a thorough system of agricultural education. Interesting remarks were also made by Mr. L. H. Kerrick, chairman of the committee on agriculture of the board of trustees of the University of Illinois, and Mr. Joseph Carter, former superintendent of schools of Champaign, Ill.

A conference on extension work in agriculture was held July 21. At this meeting Prof. John Hamilton, Farmers' Institute Specialist of the Office of Experiment Stations, outlined a somewhat comprehensive plan for the extension work of the agricultural colleges and urged the importance of organizing a corps of special workers for this service. Mr. C. A. Shamel, editor of the Orange Judd Farmer, explained the requisites of appropriate articles by college men for the agricultural press. Mr. F. H. Rankin, superintendent of extension work in the Illinois College of Agriculture, explained the methods employed by this institution to arouse the interest of boys and girls in agricultural education, discussed the question of competitive contests and prize giving, and urged that the burden of providing funds for this and other forms of agricultural education should be laid on the agricultural organizations. Prof. J. L. Stone, of Cornell University, described the different forms of extension work undertaken by that institution and emphasized especially the cooperative demonstration experiments conducted by farmers in different parts of the State as an efficient means of interesting farmers in station work. Director Burnett, of the Nebraska Experiment Station, who is in charge of farmers' institutes in that State, briefly described the institute work there, and urged that college men give more attention to the practical problems of the farmers when attending institutes. Mr. D. J. Crosby, expert in agricultural education, of the Office of Experiment Stations, described the work of the Office with reference to agricultural schools, and asked for the cordial cooperation of college men. The dean of the graduate school briefly urged the importance of such training in English in the agricultural colleges as would fit their graduates to be effective speakers and writers.

A reception was given at the residence of Dean Davenport Friday evening, July 6. This was attended by about 200 persons, including many members of the faculty of the University of Illinois.

On Saturday, July 14, about 70 members of the school visited the extensive estate (about 27,000 acres) of the Funk Brothers, near Bloomington, Ill., where crop and animal production on a large scale under the best conditions were seen, as well as considerable experimental work in breeding corn and oats. The proprietors entertained this party in a most generous manner and concluded by giving them a dinner at the hotel at Bloomington, at which Hon. L. H. Kerrick presided, and brief speeches were made by the dean and other members of the graduate school.

Informal meetings were held several evenings at the college of agriculture, at which questions relating to various phases of agricultural education were discussed. Among the subjects thus discussed were methods of teaching agronomy, the organization of secondary and elementary courses in agriculture, and the science of agriculture as a basis for the organization of a system of agricultural education. Much interest developed in the subjects presented by the different lecturers at the regular sessions, and there was a large amount of informal discussion of the subjects presented wherever members of the school met together.

Within the period covered by the Graduate School of Agriculture a Graduate School of Household Science was held at the Woman's building under the general management of the department of household science of the College of Agriculture of the University of Illinois. This was attended by about 20 teachers and other women from a number of different States. A number of the members of the Graduate School of Agriculture attended some lectures at this school, and addresses were given there by the dean and registrar of the Graduate School of Agriculture.

The dean of the Graduate School of Agriculture and Prof. J. L. Stone, of Cornell University, a member of the Graduate School of Agriculture, gave addresses on agricultural education at the general assembly of the summer school of the University of Illinois.

A meeting of the association of dairy instructors and investigators in the agricultural colleges and experiment stations was held July 17-19, and members of the Graduate School of Agriculture were especially invited to participate in the meeting of this association held on the evening of July 17, at which time addresses were made by the dean and registrar.

The general convention of the Alpha Zeta Fraternity, which is made up of students in agricultural colleges, was held July 10 and 11. Delegates from 11 colleges were present, and the convention was closed with a banquet attended by about 50 men, among whom were the dean and registrar and several other members of the Graduate School of Agriculture, as invited guests.

When news of the death of Hon. H. C. Adams was received the following resolution was adopted at a meeting of the school:

"The members of the Graduate School of Agriculture of the Association of American Agricultural Colleges and Experiment Stations, now in session at the University of Illinois, comprising representatives of the agricultural colleges and experiment stations in 27 States and Territories, desires to place on record their appreciation of the inestimable service rendered to the cause of agricultural education and research in the United States by the late Hon. Henry Cullen Adams, of Wisconsin, while a Member of the National House of Representatives, in securing the passage of an act of Congress for the further endowment of the agricultural experiment stations, which will forever bear his name and associate him in the minds of our people with Senator Morrill, of Vermont, and Representative Hatch, of Missouri, through whose wise statesmanship our agricultural colleges and experiment stations have been established and maintained.

"Adopted at a meeting of the members of the graduate school held at Urbana, Ill., July 11, 1906.

"A. C. TRUE, *Dean*.

"EUGENE DAVENPORT, *Registrar*."

The following statement was made to the president and trustees of the University of Illinois:

"The members of the Graduate School of Agriculture, held at the University of Illinois July 2-28, 1906, desire to express to the president and trustees of the University of Illinois their high appreciation of the generosity shown in giving

this school the use of the buildings and equipment of the university and in providing for its financial support."

The following resolutions were received at the end of the session:

"Whereas the second session of the Graduate School of Agriculture of the Association of Agricultural Colleges and Experiment Stations, held at the University of Illinois, has been highly successful and of great benefit to those of us who have been in attendance, which benefits will be indirectly felt in every agricultural college and experiment station; and

"Whereas the results are in large measure due to the generous efforts and cooperation of Dean A. C. True and Registrar Eugene Davenport in promoting and administering the affairs of the school, and to the courtesy of the faculty of the College of Agriculture of the University of Illinois in providing facilities for the work and accommodation of the visitors: Therefore, be it

"Resolved, That we, the undersigned members of the Graduate School of Agriculture, hereby express our appreciation and gratitude to these gentlemen, personally, and to the institutions which they represent for these attentions and courtesies."

(Signed by 47 members of the school.)

No special effort was made to advertise the school widely or to increase the number of students by offering any special inducements. It was felt that it would be well to determine at this session whether the agricultural colleges and experiment stations would take sufficient interest in a graduate school of agriculture to send to it a goodly number of students without any special pressure. This question having been settled in the affirmative, the managers of future sessions can go ahead with confidence to organize the enterprise somewhat more broadly and to impress the usefulness of such a school on a somewhat wider constituency.

The plan of having the lecture periods one hour with a half hour following for questions and discussion worked well and is preferable to longer lecture periods. The seminars were also well attended and were approved by both faculty and students. It would probably be desirable at future sessions to make provision for the more definite and thorough presentation of matters relating to the organization of courses of instruction and to methods of teaching.

There was some disappointment that the courses offered at this session did not cover a wider range. This was expressed especially with reference to dairying and rural engineering. Careful consideration should be given to this matter in planning for future sessions.

The interest in the work of the school was well sustained through the session. There was considerable going and coming of students, a few even registering during the last week. Even those who stayed only a few days seemed to feel that they had received inspiration and information which made their coming to the school worth while.

The students were more largely than at the first session the young men engaged in college and station work. There was some disappointment expressed because there were not in attendance more of our mature and experienced workers in agricultural education.

The success of this session was in our judgment sufficient to make it worth while for the institutions represented in the Association of American Agricultural Colleges and Experiment Stations to give hearty support to this enterprise, to encourage their graduates to attend future sessions, and to make some definite provision for the more general attendance of members of their faculties and station staffs. An effort should also be made to secure a larger attendance of teachers in agricultural schools and lecturers at farmers' institutes.

A. C. TRUE, *Dean.*

E. DAVENPORT, *Registrar.*

Statement of receipts and disbursements on account of the Graduate School of Agriculture.

RECEIPTS.

From Association of American Agricultural Colleges and Experiment Stations	\$822. 52
From matriculation fees of students.....	710. 00
From University of Illinois.....	1, 635. 63
Total	3, 168. 15

DISBURSEMENTS.

Honorariums of lecturers	\$1, 670. 00
Traveling expenses and board of lecturers	1, 179. 88
Printing	92. 26
Labor and miscellaneous expenses	{ 100. 58
Postage	{ 40. 43
	85. 00
Total	3, 168. 15

NATIONAL UNIVERSITY AT WASHINGTON.

The resolution of E. B. Andrews, of Nebraska, relative to the establishment of a national university at Washington was taken up for consideration, and after discussion by G. E. Fellows, of Maine; Eugene Davenport, of Illinois; A. C. True, of the Office of Experiment Stations; J. L. Snyder, of Michigan; H. C. White, of Georgia; and K. L. Butterfield, of Massachusetts, a substitute motion by J. C. Hardy, of Mississippi, to the effect "that the whole matter of the national university be referred to the executive committee with instructions to take such action as in its judgment may seem wise, and to make a full report to the association at its next meeting," was adopted.

MEETINGS IN CONNECTION WITH THE NATIONAL EDUCATIONAL ASSOCIATION.

The following resolutions, offered by K. L. Butterfield, of Massachusetts, were then taken up:

Recognizing that the recent rapid development of agricultural subjects of study in our various colleges and schools involves constantly improved pedagogical methods, and believing that such improvement would be facilitated by occasional gatherings of the various instructors in agricultural subjects: Therefore, be it

Resolved, That the executive committee of this association be requested to consider the feasibility of holding our association meetings at least once in four years in connection with the National Educational Association, and at that meeting providing a programme the specific purpose of which shall be the discussion of methods of teaching agriculture and allied subjects, and that all the institutions belonging to this association be strongly urged to have the faculties of their respective institutions present at that gathering.

Resolved further, That the executive committee be requested to report later on the practicability of this plan, or any plan looking toward a similar end.

K. L. BUTTERFIELD. In behalf of this resolution I wish to say that it is not introduced so much with the idea of holding the meeting at the time of the Educational Association as it is with the idea of gathering together the great mass of men who are teaching agriculture and allied subjects. It seems to me that these meetings are of the utmost value to those of us who can attend them; but my observation is that the great majority of the men who are engaged in the work of teaching agriculture and its allied subjects do not get in touch with the spirit of the work, and they can not do it without being present at these meetings. It seems to me that it would be very ideal if we could have every year a great gathering of agricultural teachers; but the suggestion is that once in four years we attempt to bring together the men who are doing the work in order that there might be discussions among them, especially among those who are doing the work of teaching. This meeting with the Educational Association is an important matter, because the National Educational Association stands for the general educational movement. If our men can come in contact with those men, it will be of vast benefit to us. On the other hand, if the Educational Association can come into contact with our men it will be an advantage to them. There may be objections to holding these

meetings together, but that is left to the executive committee; and if there be any better plan by which this end can be attained, then that can be considered by the executive committee and they can suggest a better plan. If at least once in every four years we can go en masse to the Educational Association, we can not only carry on our discussions along the lines in which we are interested, but we can carry on our discussions in regard to rural education. The meat of the question is whether this association is prepared to go a step further in its attempt to organize the agricultural associations of the country and take some step by which the men who are teaching, as well as the men who are demonstrating the work, can be brought together. It seems to me that there is no better means of increasing the efficiency of our pedagogical work than by this means. The proposition involved is simplicity itself. I move that the resolution be adopted.

The matter was referred to the executive committee for action.

THE BUREAU OF EDUCATION AND THE LAND-GRANT COLLEGES.

L. A. Kalbach, of the Bureau of Education, read the following paper:

The Bureau of Education was established for the purpose of collecting and disseminating information on educational subjects, domestic and foreign. In other words, it was intended to serve as a clearing house where information on the various phases of education might be obtained. In the performance of the duties for which it was established, it has collected, from its earliest days, statistical and other information respecting the colleges represented in this convention, which has been published annually in the reports of the Commissioner of Education.

Prior to the passage of the act of Congress approved August 30, 1890, popularly known as the "second Morrill Act," the rendering of reports to the Bureau by the colleges here represented was a purely voluntary act, as is the case now with all other classes of educational institutions. The act referred to, under which each State and organized Territory within the United States now receives annually the sum of \$25,000 for the benefit of the institutions established under the act of July 2, 1862, requires certain reports to be made annually by such institutions to the Secretary of the Interior and to the Secretary of Agriculture, which serve as a basis for the certification of the several States for subsequent installments of the funds authorized by the act of August 30, 1890.

While the act requires reports to be made to the Secretary of Agriculture as well as to the Secretary of the Interior, the administration of the act is, by section 5, committed to the Secretary of the Interior. When the time came to put the act into operation, it was to be expected that the Secretary of the Interior would turn for assistance to the Bureau of Education, an office of his Department, which had for twenty-three years previously been in correspondence with many of the institutions to be endowed by said act. The Bureau has, therefore, since 1890, collected and passed upon the reports required to be made by law to the Secretary of the Interior, and has recommended to him annually for certification to the Secretary of the Treasury the States and Territories that were entitled to the funds appropriated by the act. The Bureau acts as the medium of communication between the Department of the Interior and the several colleges in the same way as does the Office of Experiment Stations between the Department of Agriculture and the agricultural experiment stations in the several States and Territories.

In the administration of the act of August 30, 1890, it has always been the policy of the Bureau to construe its provisions as liberally as possible without violating the spirit and intent of the act. While at times it has been found necessary to disallow certain expenditures charged against the funds appropriated by Congress, it must be said that the institutions are manifestly endeavoring to restrict the expenditure of the funds to instruction in the branches of study enumerated in the act, and very little, if any, friction has been encountered in the correspondence of the Bureau with the institutions.

As stated before, the statistical and other information furnished by the several institutions is published annually in a chapter entitled "Agricultural and

Mechanical Colleges" in the report of the Commissioner of Education. In addition to the statistical information with respect to professors, students, property, income, etc., the chapter includes statements with respect to new courses of study, changes in courses of study and admission requirements, and the structural character, cost, and purpose of new buildings, in so far as such items are communicated to the Bureau. It contains a summary of the legislation affecting the land-grant colleges that was enacted during the year covered by the report which is compiled from the session laws of the several States. An enumeration of the courses of study offered by each institution is also given.

In the reports of the Commissioner of Education for the years 1902 and 1903 there was published a compilation of the laws relating to agricultural and mechanical colleges, as such laws appeared in the revised statutes of the several States, to which were added session laws of importance not included in the revised statutes or general laws. These laws, while originally published in two separate reports, have been reprinted and bound in one volume and may be had on application to the Bureau.

Among the most important legislation enacted during the year 1905 may be mentioned the following:

Changes in the governing boards of the institutions in Florida, Michigan, Nevada, New York, and Pennsylvania; a general reorganization of the system of higher education in Florida, including the University of Florida, whose location was changed from Lake City to Gainesville; provision for an annual tax levy of two-sevenths of a mill in Wisconsin and three eighths of a mill in Wyoming. California appropriated \$150,000 for a farm and buildings for an agricultural school; Minnesota provided for an agricultural school at Crookston, and New Jersey for short courses in agriculture. Utah provided for a commission to investigate the duplication of work by the agricultural colleges and the university. Wisconsin appropriated from its general fund \$200,000 annually for three years for buildings and equipment. Connecticut provided for the investment of the land-grant fund, and requires the State treasurer to pay 5 per cent per annum on the principal of said fund. Generous provision was made in many other instances for buildings, maintenance, and experimentation in agricultural subjects.

In 1906 Iowa provided for a special tax levy of one-fifth of 1 mill on the dollar for new buildings; requires the establishment of a department of ceramics; appropriates annually \$25,000 additional for general support; support of engineering experiment station, \$3,500; good-roads experimentation, \$5,000, etc.

New York, which appropriated \$250,000 in 1904 for new buildings for the State College of Agriculture, in 1906 appropriated \$100,000 for the promotion of agricultural knowledge throughout the State and for the maintenance of the college of agriculture.

Ohio increased its tax levy for the Ohio State University to sixteen one-hundredths of a mill, and appropriated from the general fund of the State \$45,000 for land, \$80,000 for agricultural buildings, \$10,000 for live stock, \$75,000 for engineering buildings, \$60,000 for a woman's dormitory, besides a number of other special appropriations.

Rhode Island has increased its annual appropriations from \$15,000 to \$25,000.

Virginia appropriated, among other items, \$50,000 for the completion of the agricultural building.

The reports furnished by the several colleges show remarkable growth in all directions. In 1895 the total number of students reported in agricultural courses was 2,712, while in 1905, ten years later, there were reported 2,473 students in four-year courses and 4,945 in short and special courses, making a total of 7,418. In the same period the students in engineering increased from 5,317 to 12,969. The aid granted to the colleges by the several States has increased from \$1,789,235 in 1895 to \$5,768,786 in 1905, an increase of over 220 per cent. The total income of the institutions, omitting the experiment stations, was, in 1905, over eleven and a half million dollars, of which nearly one-half was furnished by the States and less than one-fifth from Federal sources. The total amount that has been paid to the institutions under the act of August 30, 1890, is \$18,802,000.

These facts give some idea as to what the Bureau of Education is doing in the way of collecting and disseminating information with respect to land-grant colleges. It is the aim of the Commissioner of Education to make the Bureau

increasingly useful to those for whom it was established, namely, the educators of this country; to make of it a veritable bureau of information on educational topics. Especially does he wish to make it of greater service to the institutions represented in this association, and to that end he invites criticisms and suggestions for the betterment of its work. Having been connected for some years with one of the institutions belonging to this association, he is, naturally, deeply interested in the work being done by you, and he trusts that all of you will feel free to apply to him for any information that he may be able to give or that he may be able to obtain for you. In turn, he requests that he be furnished promptly, either by means of correspondence or through printed matter, with any information that may be of use to other members of this association. In short, he asks for your cooperation in all ways possible to make the Bureau of greater value to yourselves.

It may be added that the Commissioner is particularly impressed with the proposals which have been made from time to time for the extension of the means of helpful cooperation between the Bureau of Education and the land-grant colleges, of which the resolution adopted by this association in 1895 is an example. He is particularly desirous of finding ways in which more information of a helpful character in the prosecution of the work of these colleges may be collected by the Bureau and disseminated in the form of additional publications, and ways in which a more personal and continuous relation may be maintained between the office at Washington and all of the institutions represented in this association.

SCIENTIFIC INVESTIGATION UNDER GOVERNMENT AUSPICES.

H. P. Armsby, of Pennsylvania, offered the following resolution, which was referred to the executive committee:

Resolved, That there be appointed by the incoming president of this association a commission consisting of five persons, two representing the research efforts of this association, one representing the United States Department of Agriculture, and two representative scientific men not connected with official agricultural investigation, the duty of which shall be to inquire into and report to this association the organization and policy that in the opinion of the commission should prevail in the expenditure of public money provided for scientific experimentation and research in the interests of agriculture, to the end that such funds shall be applied in the most economical, efficient, and worthy manner to the production of results of permanent value. (For discussion, see p. 62.)

The convention then adjourned until 7.30 p. m.

EVENING SESSION, THURSDAY, NOVEMBER 15, 1906.

The convention was called to order at 8 p. m., President M. H. Buckham presiding.

INVITATIONS.

T. D. Boyd and W. R. Dodson, of Louisiana, invited the members of the association to visit the Louisiana State University and the experiment stations.

W. H. Jordan, of New York, invited the next graduate school to hold its sessions at Cornell University and Geneva.

ELECTION OF OFFICERS.

L. H. Bailey, of New York, on nomination of C. F. Curtiss, of Iowa, was elected president of the association. T. D. Boyd, of Louisiana, was nominated and elected first vice-president; M. A. Scovell, of Kentucky, second vice-president; B. C. Buffum, of Wyoming, third vice-president; R. W. Stimson, of Connecticut, fourth vice-president; and C. G. Hopkins, of Illinois, fifth vice-president; J. L. Hills, of Vermont, secretary-treasurer; and A. C. True, of the Office of Experiment Stations, bibliographer.

The association then adjourned until Friday morning, November 16, 1906.

MORNING SESSION, FRIDAY, NOVEMBER 16, 1906.

The convention was called to order at 9.30 a. m., President M. H. Buckham presiding.

INCREASED APPROPRIATIONS FOR LAND-GRANT COLLEGES.

H. J. Wheeler, of Rhode Island, presented the following resolution:

Whereas since the passage of the Morrill Act of 1890 no further Federal grants have been made for agricultural and mechanical education, notwithstanding the crying needs for such additional support: Therefore, be it

Resolved, That the executive committee of this association be authorized to cause to be introduced in Congress a measure drawn on the same general lines as the Morrill Act of 1890, providing for an increased appropriation for each of the land-grant colleges.

On motion seconded, the resolution was adopted without objection.

SCIENTIFIC INVESTIGATION UNDER GOVERNMENT AUSPICES.

The resolution of H. P. Armsby, given on page 61, was then taken up for consideration.

H. P. ARMSBY, of Pennsylvania. I think the purpose of the resolution is thoroughly obvious. What is contemplated by it is simply to inquire into the existing conditions with a view of seeing whether any better or more systematic organization, any better definition of the functions of the various agencies for research in the interests of agriculture can be reached. There is a great deal of research work carried on outside of the experiment stations and the Department of Agriculture which relates to agricultural progress, and which has never been brought, so far as I know, into any definite relations with this association. The resolution provides, therefore, for the appointment on this commission of two broad scientific men outside of the members of this association, with a view of bringing our agricultural forces into closer relation with the work of this association. The resolution provides that the commission shall be appointed by the incoming president in order that those who may make up the commission may be appointed after serious consideration. Such a commission should be appointed only after a great deal of consideration and ought not to be loaded upon the retiring president after the close of a convention like this. I certainly hope that the convention will take this proposition under serious consideration, and should it see fit to authorize the appointment of such a commission I will feel that a step has been taken in the right direction, even though it may take two or three years for the consideration of the problems which will confront the commission.

C. F. CURTISS, of Iowa. My understanding of this resolution as it has been stated by Director Armsby is that it involves a very important step, and I think it ought to have very careful consideration before the association commits itself to this policy. I question whether we know enough about the plan or not. So far as the object and purposes of the commission, as stated in the resolution, are concerned, relating to the experiment stations represented in this association, it occurs to me that the Office of Experiment Stations already performs that function. I do not know just why another agency should be created to perform the same functions that the Office of Experiment Stations is now performing. Perhaps, however, this commission should have a wider scope than that. There are a good many questions involved in this, and I doubt if the members of the association have given it yet the careful consideration that should be given a question of this kind. The proposition is rather indefinite. I should like to see it more clearly defined. It has been suggested that a com-

mission of this kind would probably have to serve two or three years. A part of the membership of this commission is to come from outside of this association and outside of the Department of Agriculture. It is probable that a commission of this kind that would give serious consideration to these questions might involve the association in considerable expense, and I believe all these matters ought to be considered before we enter into this plan. I believe that we should defer this matter for at least one year in order that we may give the matter more mature consideration.

W. H. JORDAN, of New York. This resolution is certainly one of the most important that has ever been offered before this association, and I fully agree with the last gentleman speaking that it should receive mature deliberation. I am convinced, however, that this body of men is sufficiently conversant with the situation that has faced us for so many years to apply mature judgment to this matter at this time. I trust, therefore, that the resolution to lay this subject on the table for one year will not prevail.

Careful and well-informed observers are united, I believe, in the conviction that we have reached a turning point in the development of agricultural science in this country. Up to this time the work of the colleges and stations and the efforts of our National Department of Agriculture have been largely devoted to the exploitation of existing knowledge and to dealing with mere economic relations. Some real research work has been undertaken and important results have been reached, but our main effort has been that of adjustment of scientific truth to agricultural practice. But the time has come when we begin to feel, as never before, the great need of enlarging the boundaries of knowledge, and now we face several important questions, some of which have lain in our minds for a long time.

It can not be said that public funds are now being applied to agricultural research in accordance with any broad, well-defined policy. Since 1868 we have been feeling our way—development has been more or less a pushing out into untried fields under conditions that were new. Now we have a basis of experience.

Several questions confront us. We are not quite sure, I think—indeed we have some doubt whether it is so—that agricultural research is maintained in this country in an environment that is favorable to permanent results of a high character. Are our relations to Government control what they should be? Have we full scientific liberty? Is it desirable to combine within the activities of the same individual the work of research and of exploitation? Is there a proper adjustment between the various agencies that are active within the agricultural field? Do the results of so-called agricultural research command the respect of scientific workers in other fields, and if not, why not? Have we a desirable unity in the movements of science in this country? Some of these questions should be answered, and in an intelligent way.

I can see no harm in such a commission as is proposed; indeed, I anticipate great good from its deliberations. This association should seek all the information it can get. Certainly the rights and status of individual institutions are not in any way menaced by the proposed inquiry.

Of course, such a commission has no authority beyond that which comes from the character and standing of the men who compose it, and any report which it may make will not have a binding quality but will simply be advisory in its character.

K. L. BUTTERFIELD, of Massachusetts. It seems to me that the suggestion made by Director Armsby and that made by Director Jordan are entirely satisfactory, and that the aim of the resolution is worthy of the support of this

body. I can not help asking the question, however, why the aims can not be met by our own committee on experiment station work, instructing them to engage in conferences with such outside men as are designated in this resolution? It seems to me that it is within the province of our committee on experiment station work to take up just such questions as this, and if it is desirable to confer with the agencies that are doing scientific work, they should have the authority to do so. I think it may be made a part of their work.

W. H. JORDAN. I would say that such a scope of inquiry is quite outside of the duties of a committee of merely a section of this association.

E. DAVENPORT, of Illinois. It seems to me that the matter stands like this: From the very nature of the case no report that could be made by any committee of this association, no matter how it might be handled, would have the standing in the world of science that a report from an independent commission would have. This committee of ours no doubt could do things that might be satisfactory to the experiment station people. We may be able to obtain a satisfactory report from this committee to us, but how would the report be received by the scientific world at large? It seems to me that we have reached a point where we are asking what agricultural science is going to be. We were utterly ignored for a long time, then we were tolerated, and we are coming now to enjoy some of the symptoms of respectability in the educational world, and, to some extent, in the scientific world. Now, it seems that within the last five years almost anything relating to agricultural research has been a thing to conjure with. But we are standing on dangerous ground. There will be a day of reckoning with us if we are not careful. Such a resolution as this would have been absurd ten years ago, but it will be too late if we wait ten years longer. I feel extremely anxious to have this matter settled in the best way, but before we put up much more for agricultural research is it not well to ask ourselves whether the work is being done in the best way? A tremendous amount of work has been done in this country; but we have been doing primary work, and it must progress very much further along scientific lines if we expect to hold the position that belongs to us.

L. H. BAILEY, of New York. In my own work I find myself inclined more and more to refer large questions of policy to persons who are outside our work entirely if they have been scientifically trained and have had to do with public policy questions. Not long ago a question of policy for the College of Agriculture was laid before the deans of the different colleges. It was a help and relief, of course, to secure the points of view of competent men with a different orientation to the subject. It seems to me that we are in the process of gradually eliminating departmental science. Agricultural research is going to take its place with other research and to be regarded as a part of the body of science. I am afraid that we are in danger of becoming somewhat prejudiced in our own point of view, and perhaps somewhat superficial. I am wondering whether the time has not come when we ought to coordinate our agricultural work with the whole body of human science and knowledge. Outside the agricultural colleges there is much work of a research character that has distinct agricultural bearings, although not labeled as such. Some of the institutions that have no agricultural departments are, nevertheless, doing work that we, as agricultural investigators, should be thoroughly conversant with. In the subject before us we have a question of large public policy. If it seems to be wise for any one person or one institution to ask for expert nonpartisan advice from those outside, I do not see why it is not equally wise for this association to ask for such advice. There are three questions to be considered: First, the selection of the commission; second, the funds to maintain it; third, the work that it is designed to do. So far as the

last proposition is concerned, taking them in their inverse order, I should be inclined to leave the whole matter in abeyance. All we are called on to do is to appoint the commission, and not to instruct it. If the commission is formed it will soon begin to work, and its plans will formulate as the work goes on. Possibly a year from now the commission may have specific recommendations to make to this association. If such recommendations call for appropriations, the matter can be taken up then. The constitution of such a commission is a most important question. I should suppose that possibly the most important and useful members of it would be those who do not represent this association as delegates, provided they are men who have high ideals in scientific work and have had experience therein and who have come in touch with questions of public policy. It has been suggested on the floor that this commission would have no power. It seems to me that it will have the greatest power that any commission could have, which is the power coming from the weight of high authority. We are not considering at all an investigation, using that term in its ordinary sense. We merely seek for advice and opinions. This organization has the right always to ask for advice and to ask for the opinion of any person on any subject that comes within its purview; and if this association desires that three or five persons shall be asked specially to give advice, it certainly has the right to do so. When the report of this commission is made, we can determine what we shall do with it. I presume that we should merely print it. If it is a wise report, as we have every reason to expect it will be, it may be sufficient to have it as a part of our minutes for our guidance and discussion. Sooner or later the question will be asked of us what we are accomplishing. Perhaps this commission can give us a judgment as to how much real progress we are making. I should not be surprised if such a report would be a sort of a milestone to measure our progress, whether that progress be much or little. Now that this question is up, it seems to me that we can not afford to miss the opportunity of securing the advice of such a commission for our own help and guidance. Sooner or later we must face the responsibility of review by expert public opinion.

As to the funds, I fancy that none will be needed. The commission will need to meet a few times, but possibly the expense of it can be arranged by the members of the commission. Each member will acquire the facts as he wants them, and the commission will deliberate until it is fully ready to make its report.

W. H. JORDAN. I think if the members of this association will look up what has been done in educational lines they will find that the beginning of many great advances has been made by the appointment of special commissions and studying the reports from them. It seems to me, from my observation, that nothing can be better from a standpoint of the agricultural interests of the country than to have a commission of this sort appointed. I should be very much opposed, however, to the establishment of such a commission without provision for adequate funds.

L. G. CARPENTER, of Colorado. There is a question upon which the association is entitled to further information than it has yet had, and that is, where is the money to come from and how is it to be raised to meet the expenses of this commission. This commission, if it does anything, will require money. Now, we need to know where we can get the money to carry out the object of this commission.

L. H. BAILEY. I venture the prophecy that that commission can be so constituted, its work so undertaken, as to entail practically no expense. I think there are enough public-spirited men in the country who are interested in re-

search and investigation work who will be glad of the opportunity to serve this organization and to serve the progress of science by giving their time to it.

L. G. CARPENTER. It seems to me the scope of the commission ought to be well defined. Different advocates understand the resolution differently. One considers it to be a commission to investigate and report on experiment station work in general. Another, as a commission to advise the stations how to attack their special problems. Our station specialists are studying their own problems earnestly, and often with long experience, and I do not believe any body of two or five men could be of much benefit in advising the individual investigator, or at least not in many lines. The best effect from such commission might be to crystallize our own ideas. If the idea is for the commission to give a certificate of character, this will be of no weight unless the commission also is expected to criticise the whole field of experiment station work. The station forces have for years been attempting to work out these problems, with special knowledge of the local field. I can not believe that much help could be obtained from such commission, although, in the broader question, it may be of a great deal of use. Under some interpretations of the scope of their organization, such a commission might be of great service, but under other possible interpretation it might do much harm.

Under present understanding of the resolution, I feel like asking for the postponement of the question for further consideration.

W. H. JORDAN. It seems to me that we should not confuse these questions or interpose elements into the resolution which are not really to be found there. There is no hint in that resolution that there is to be an inquiry into the method of individual institution, or individuals, nor that it is to be a certificate of good character. It may be found to be a certificate of good character, or it may be in the broadest sense a recommendation of character, but there is no hint of that in the resolution. It is simply to enchain and to crystallize what is being done in the country. We are in a stage of development, and I am sure we are all of us impressed with the importance of the great problems which are before the country, and we realize the necessity of agreeing upon the best lines of policy, and that is the real reason for this resolution, in order that we may sympathetically work together. We are not bound by any report of the commission. We simply seek information, and information that will bind together the forces of the country.

J. K. PATTERSON, of Kentucky. A few moments ago one of the speakers said something which surprised me a great deal. He suggested that within a few years we might be put upon our mettle to hold what we have. Now, I should like to know what he considers the element of weakness in the structure which we have been laboriously building for twenty years. If there be serious grounds for discontent, I should like to know from what they come and what they are, so that we may be prepared to meet them. I think that this association, representative as it is of the experiment stations of the country and of the colleges created by the land grants, is doing a splendid and a noble work. Now, in a course of twenty-five, thirty, or forty years mistakes have been made, but in the course of time we endeavor to remedy those mistakes; we endeavor to eliminate anything that is injurious, and I think this association has worked toward the better unity of its purpose. If there be a weak point in it anywhere, we should know where it is so that we may be able to meet it. If we are confining too exclusively to our own work, that is a matter for legitimate inquiry. But I would like to know some of the elements of discontent that confront us before I would be willing to vote on this proposition.

If we be in danger, then I am willing to seek eligible means of escape wherever they can be found. If we be no longer able to work along the lines of splendid utility which have characterized our achievements in the past, then I am willing to follow any eligible lines wherever they are practical.

E. DAVENPORT. I dislike to take any more time in the discussion of this proposition, but I can answer this question at least to my own satisfaction very clearly. Any man who has seen passed over his desk for the last ten years letters of inquiry from the farmers must have noted a decided change in their tenor. Any man who meets these questions fairly and fully must have been impressed with the fact that there are plenty of farmers with college education and college experience who are writing for information along the latest lines of scientific investigation. What I need in the matter of answering these questions now is more knowledge in certain lines of chemistry and certain lines of physics. Now, we must do one of two things. We must either secure outside assistance in order to keep up with the demand for information in certain lines of agricultural science, or we must do the work of broader investigation ourselves. In the meantime our farmers are putting questions to us that we can not answer. We have reached a position where it is necessary for us to undertake to discover that knowledge which is necessary to answer these questions. General science has never addressed itself to our problems. There are plenty of men engaged in scientific research that will turn their attention our way if we only encourage them to do so. You know that in the last five years there have been plenty of scientific men who have turned their attention to agriculture. We have gotten up to where we are against a stone wall in many lines. I think there is a feeling of the most stupendous confidence in what the experiment stations can do, but if we are to meet these expectations a very large amount of highly scientific work must be done and along substantially new lines.

B. I. WHEELER, of California. I am very much impressed by the expression of the views on this subject entertained by your next president. I have never heard anything of this resolution until I heard it this morning, but I should think you would be anxious to have such a commission appointed. I can not see that any danger to agricultural science lies hidden in this resolution. I know the people out where I live are interested in everything that you can do to advance agriculture by means of the experiment station. The only thing that can do any harm is the closing of the doors. If it means the opening of the doors I can see no danger in it. We feel in California that agricultural development has been groping through many years of darkness and we welcome any movement which tends to open the doors to more light. There are forces at work that are vieing with each other. We do not understand in California why the United States Department of Agriculture should not broaden out the work, why they should not mix in the work. We would like to mix with them and know what they are doing. We like to have transactions with them. We should like to have a common field with them and divide the work. We are feeling somewhat in California that things have been done in a haphazard way. There is an enormous amount of work to be done and we have not enough people to do it. If this is a movement in that direction I wish to say, and I speak for California, that it is one which I shall heartily support.

H. P. ARMSBY. At the close of this debate there are one or two things I want to emphasize. I think there has been a little tendency to avoid the resolution and to get lost in detail. This resolution was intended to be a very broad matter. Its purpose looks to a consideration of this subject from the very broadest point of view of public policy. It is not a question of individual

workers or individual stations. This resolution does not look backward, but forward. It is not a measure of protection, as I see it. It is not a question of whether we shall avoid some danger; it is a question of whether we shall undertake to assist and aid in the efforts for progress in agricultural science. The resolution should be considered from that point of view—the point of view of public policy, and of endeavor to make greater progress in the future than we have done in the past.

The motion to defer action on the resolution for a year was lost.

A motion to adopt the resolution was carried.

On motion of H. J. Waters, of Missouri, the executive committee was instructed to assign a prominent place on the programme to the report of the commission whenever it is ready to make a report.

OFFICERS OF SECTIONS AND MEMBERS OF EXECUTIVE COMMITTEE.

H. C. Price, of Ohio, reported the following officers elected by the college section: Chairman of section, E. A. Bryan, of Washington; secretary of section, H. C. Price, of Ohio; members of executive committee, H. C. White, of Georgia; J. L. Snyder, of Michigan; and W. E. Stone, of Indiana; committee on programme, the chairman and secretary of the section.

B. C. Buffum, of Wyoming, reported the following officers elected by the section on experiment station work: Chairman, M. A. Scovell, of Kentucky, secretary, C. E. Thorne, of Ohio; members of the executive committee, W. H. Jordan, of New York; and C. F. Curtiss, of Iowa; committee on programme, H. J. Waters, of Missouri; H. T. French, of Idaho; and C. E. Thorne, of Ohio.

The officers named were confirmed by the general session.

MEMBERS OF STANDING COMMITTEES.

The president announced the following three-year members of the standing committees to fill the annual vacancies:

Committee on instruction in agriculture: J. F. Duggar, of Alabama, and W. E. Stone, of Indiana.

Committee on graduate study: W. O. Thompson, of Ohio, and Brown Ayres, of Tennessee.

Committee on extension work: A. M. Soule, of Virginia, and W. M. Hays, of Washington, D. C.

Committee on experiment station organization and policy: M. A. Scovell, of Kentucky, and C. E. Thorne, of Ohio.

ANNUAL DUES.

On motion of J. L. Hills, the annual dues for 1907 were made \$15.

K. L. Butterfield, of Massachusetts, presented the following report:

REPORT OF COMMITTEE ON EXTENSION WORK.^a

Your committee decided that its first task was to make an investigation into the present status of agricultural extension teaching in the United States. The hearty cooperation of the Office of Experiment Stations of the United States Department of Agriculture was easily secured, and Prof. John Hamilton, Farmers' Institute Specialist in that Office, was designated to assist the committee. The committee thereupon chose him as its secretary, and he has carried on the details of the inquiry. We desire to express our cordial appreciation of the assistance of the Office of Experiment Stations, and particularly to indicate our great obligation to Professor Hamilton, whose thorough sympathy with extension teaching in agriculture, his long experience in work of this

^a See also U. S. Dept. Agr., Office of Experiment Stations Circ. 72.

character, and his enthusiasm for progress have enabled him not only to place before your committee important data, but to embody many suggestions for the development of the work. Your committee has not hesitated freely to utilize his comments and suggestions.

A schedule indicating the forms of extension work to be embraced by the investigation, together with a list of queries, was prepared and sent out by the Office of Experiment Stations, accompanied by a circular letter signed by the Director of the Office, to about 5,000 persons representing the various organizations from which information was desired.

There was also formulated the following tentative definition of extension teaching in agriculture as a basis for the investigation:

"Extension teaching in agriculture embraces those forms of instruction, in subjects having to do with improved methods of agricultural production and with the general welfare of the rural population, that are offered to people not enrolled as resident pupils in educational institutions."

The committee also attempted to group in some logical fashion the various forms of extension work which were supposed to be in vogue. Six groups were made, as follows:

Group A, Farmers' institutes.—The farmers' institutes are a phase of the itinerant lecture system classified under Group B, but they form so large and distinctive a movement that it seemed wise to put them in a class by themselves. Historically they are the earliest form of organized extension teaching. They have been for thirty-five years the means of disseminating real agricultural teaching. They are supported by large grants of money, are now pretty thoroughly organized, and the institute workers have an association of their own. For these reasons they demand a separate classification.

Group B, Itinerant lectures other than farmers' institutes.—Here are listed the lectures and addresses given by members of the agricultural college and station staff and by employees of other institutions, including miscellaneous lectures, regular courses of extension lectures, traveling schools of various types, special railroad trains designed for educational purposes, and addresses before teachers' institutes on distinctively agricultural themes. Various minor endeavors must, of course, also be grouped here.

Group C, Literature.—Comprising those forms of extension teaching developed by means of written and printed material. This literature consists of the great mass of regular correspondence about agricultural subjects carried on through the experiment stations, colleges, boards of agriculture, etc.; also the various publications of these institutions, including station bulletins, regular reports, miscellaneous pamphlets, and the like; correspondence courses; reading courses; traveling libraries; and the publication, particularly by educational institutions, of periodicals dealing with agricultural subjects.

Group D comprises all those efforts in which the particular emphasis is laid on *object lessons*, or *outdoor practicums*. These include such activities as field demonstrations of various operations, such as spraying; cooperative demonstrations in which, because of the nature of the work, it is necessary to have the assistance of the individual farmer; and cooperative tests, as of varieties adapted to different localities. These tests, by the way, are close to the border line between the work of the experiment station and of the extension department, but are classified here because in many cases they are essentially for the purpose of education and not for the gaining of new knowledge. Educational exhibits at agricultural fairs, made by colleges, experiment stations, etc., and attempts to secure visits of inspection to the colleges and stations by farmers and others interested, where these visits are essentially for the purpose of education, also come in this group.

The above four groups, A, B, C, and D, are intended to include all of those forms of extension teaching in agriculture which belong to universities, colleges, and other departments, agencies, or institutions whose work is distinctively and primarily educational.

Group E, on the other hand, was meant to include those aspects of the work of the multitudinous rural societies, as carried out in their meetings and propaganda, which aim to instruct. These may comprise the efforts of agricultural fairs to introduce educational features; programmes of the various horticultural, live-stock, and other agricultural societies; lecturer's hour in the grange; village improvement societies; civic associations with rural betterment sections; rural study clubs; boys' and girls' agricultural clubs or institutes, such as the Junior Naturalists in New York, the Nature Guard in Rhode Island, etc.; and agricultural students' unions of various types. Rural societies, in carrying out

many of these lines of endeavor, are quite dependent upon the colleges and stations for their material, and oftentimes for the initiative. Nevertheless, the classification is logical, because eventually the work must be fostered and developed through the capacity and persistence of the voluntary organizations themselves.

Group F.—It was meant here to outline a field which is somewhat indefinite in character, but one in which the colleges have a part, together with other agencies. It comprises that form of endeavor which attempts to secure cooperation among various rural organizations and institutions, such as efforts to secure joint sessions between other associations, the organization of associations of teachers and school patrons, the formation of leagues or federations of rural societies for rural progress, the installation of a town room as a sort of social center for the town, etc.

It will be noticed that no provision has been made for special or short-course teaching as at present carried on at the agricultural colleges. Whatever may be the advantages from the administrative point of view of listing this work as extension teaching, it was agreed by the two committees that the discussion of short courses belongs to the committee on instruction in agriculture.

It will be observed further that this entire classification is based primarily upon varieties of work to be done, and secondarily upon types of institutions doing the work. It is an attempt to lay out a logical division of the field of extension teaching. Doubtless it may have to be changed in details as our work proceeds. We have here outlined it at some length because of the fundamental necessity of presenting at the outset some comprehensive analysis of the problems which we are set to investigate.

RESULTS OF THE INVESTIGATION.

In presenting the results of our inquiry in as concise form as possible we wish to call attention to the fact that this investigation is but a preliminary survey and must necessarily be more or less superficial. It has, however, been worth while, in order to get into touch with the work actually being done and to secure the proper point of view.

The following table indicates the classes of institutions or agencies addressed, the number of replies received, and the number in each class reporting some form of extension work:

Results of inquiry into agricultural extension teaching.

Institution or agency inquired of.	Number of inquiries.	Replies received.	Number reporting some form of extension work.
Agricultural colleges and experiment stations.....	104	52	38
Colleges other than agricultural.....	380	244	19
Normal schools.....	256	60	25
Industrial high schools.....	120	18	15
State and county departments of public instruction.....	1,600	277	123
State and county agricultural organizations.....	1,100	123	54
Libraries.....	900	125	17
Granges, State and national.....	30	12	6
Agricultural press.....	406	30	15
Industrial organizations not agricultural.....	118	15	2
Miscellaneous replies.....		45	3
Total.....	5,014	1,001	317

The column in the table showing the number of institutions reporting some form of extension work is perhaps the most significant result of the investigation. According to this report, there are over 300 active centers of extension teaching in agriculture already established. Doubtless this number would be greatly increased if others had replied. Nearly all the agricultural colleges and experiment stations in the land are doing extension teaching to a greater or less degree, and practically all of the granges and thousands of agricultural societies of various sorts do work that could be called extension teaching in agriculture. But even on the basis of the replies received it is evident that extension teaching has secured a strong foothold in our system of agricultural education.

We shall not take time to specify all the lines of extension work carried on by these various agencies, but a relisting of the forms of extension work actually carried on by agricultural colleges and experiment stations, based on the returns sent in, will be of interest as showing the infinite variety and scope of the work already under-way.

- Lecturing at farmers' institutes.
- Holding normal institute schools for institute lecturers.
- Providing short course in agriculture.
- Equipping and accompanying railway specials.
- Assisting at teachers' institutes.
- Courses in corn and stock judging given in district centers.
- Lectures in district normal schools.
- Visiting and lecturing in rural schools.
- Holding summer schools for teachers.
- Sending out field specialists to give advice to farmers.
- Preparing courses of study for agricultural high schools.
- Traveling instructors to lecture before granges, farm clubs, etc.
- Equipping and sending out traveling "vans."
- Correspondence (ordinary).
- Preparing and sending out bulletins, reports, and circulars.
- Conducting reading courses.
- Conducting correspondence courses.
- Preparing articles for the public press.
- Sending out model agricultural traveling libraries.
- Conducting and publishing agricultural journals.
- Preparing extension lectures in agriculture for rural schools.
- Conducting agricultural correspondence courses for teachers.
- Organizing and conducting school-garden work.
- Organizing and conducting field demonstrations.
- Holding field meetings for instruction.
- Conducting cooperative experiments in agriculture.
- Providing educational exhibits at fairs.
- Organizing excursions to the college by agricultural associations and by individual farmers.*
- Organizing excursions by associations of teachers to the college.
- Conducting field experiments and tests in cooperation with the railroads.
- Conducting experiments and field demonstrations in cooperation with the National Department of Agriculture.
- Conducting experiments and demonstration tests on county poor farms.
- Lecturing in grange halls.
- Lecturing before women's clubs.
- Organizing farmers' clubs, women's clubs, and boys' and girls' clubs.
- Organizing agricultural students' unions.
- Sending agricultural students to judge stock, fruit, etc., at fairs.
- Organizing for conducting nature-study work in the public schools.
- Organizing societies of farmers in each county.
- Organizing agricultural high schools.
- Creating department of extension work in the college.
- Making study of social and economic questions of agriculture.

In colleges and universities not distinctively agricultural almost no work of true extension character is being done. On the other hand, the normal schools are putting forth a surprising amount of effort, although only 25 out of 256 schools addressed reported extension teaching. The variety and scope of their endeavors are suggestive. Not only are these schools giving courses in agriculture as a preparation for teachers to teach nature study, school-garden work, and elementary agriculture, but they are also going out with lectures on agriculture before teachers' and farmers' institutes, are bringing conferences of farmers to the schools, offering excursions by students to farms, giving demonstrations in spraying, etc., issuing monographs on agriculture and horticulture and school bulletins on gardens, and preparing articles on agriculture for the public press. They are also organizing school and home improvement clubs, studying questions of rural sociology, and in other ways putting themselves in touch with the farmers, teachers, and pupils in the rural communities.

It is also interesting to note the activities of State and county superintendents of public instruction. One hundred and twenty-three of these reported some form of extension teaching; and the scope of their work, based upon the different kinds of activities which they are fostering, is gratifying as well as surprising. It

would unduly prolong this report to give even a list of these activities. They comprise not less than 55 items of extension effort.

Libraries, State and local, are also entering the field, 17 reporting traveling libraries, lectures, lecture bureaus, etc.

It has not been feasible as yet for your committee to make a comprehensive study of extension teaching on the basis of groups of work. Except in the case of farmers' institutes, few of the colleges and other institutions have thoroughly organized their extension teaching; hence the replies gave very little material for such a study. The farmers' institutes are the most thoroughly organized form of extension work, and the Office of Experiment Stations already contains such full information respecting them that no inquiry blanks were forwarded to the managers of institutes.

GENERAL CONCLUSIONS.

This preliminary survey of agricultural extension teaching in the United States seems to lead to the following conclusions:

(1) The fact that only 6 per cent of all the persons addressed reported extension work of any character shows the field that is opening up in this line of educational effort. On the other hand, the fact that 317 agencies of various sorts are at work is indicative of a splendid beginning, particularly when we add to this the immense amount of farmers' institute work now being done.

(2) Nearly all the institutions are feeling their way. The scattered nature and unorganized character of the work are obvious and significant. Only a few institutions have organized departments of extension teaching. The work thus far has grown out of the needs of the farmers and the desire of the younger institutions to win the regard of the farmers as well as to instruct them. All these efforts have been seriously limited by the financial resources at hand and the small amount of time at the disposal of employees of the institutions. The inquiry also disclosed, or rather emphasized, the well-known fact that the agricultural experiment stations are doing an enormous amount of extension work, not only through the printed bulletins and the mass of correspondence of station officials, but also through demonstrations, lectures, and many other lines of effort. Absolutely no criticism can be offered of the spirit in which this work is done or of the good effects produced, but it may be asked, Why should the experiment station longer burden itself with extension teaching? Why should it not turn over all of the duties just enumerated to other hands, and thus free itself, in time, in money, and in energy, for concentration upon the gigantic problems of genuine research?

(3) Our correspondence has brought out the most encouraging fact that the country people universally appreciate what has been attempted in agricultural education in their behalf, and most encouraging of all is the evidence that the information already given is merely a stimulus to a demand for further systematizing, perfecting, and expanding along these lines of effort. Apparently also an increasing use is being made of agricultural literature. Extension teaching is one of the chief means of encouraging country people to read this literature. Even the children in the schools are now reading about farming and are taking an intense interest in agricultural study, both in town and country schools.

(4) It seems evident to the committee that the time has arrived for a much more complete organization of extension teaching in agriculture. Only a few institutions have thus far attempted any such organization. But the work is so important, and so much of it, although in a rather desultory way, is being accomplished, that the need of concentrating, systematizing, coordinating, and developing the more important aspects of extension teaching, particularly in our land-grant colleges, becomes clearly apparent.

RECOMMENDATIONS.

Your committee would recommend—

(1) That each college represented in this association organize as soon as practicable a department of extension teaching in agriculture, coordinate with other departments or divisions of the agricultural work, with a competent director in charge and, if possible, with a corps of men at his disposal. This department should take on, just so far as possible, all phases of extension teaching now performed in other ways. Your committee hopes at some future time to suggest a scheme of organization and effort which would be applicable to

most institutions. At present, however, it merely advises this initial and all-important step—that of having an official whose chief business it will be to foster, to systematize, and to organize for the institution all the phases of extension it cares to assume.

(2) If, in case of any agricultural college, this step is at present impracticable, we would recommend most strongly that the college appoint a faculty committee on extension teaching in agriculture. This committee can be of great assistance to your own committee in further investigating conditions and methods of extension teaching in the respective States. Further than that, each one of such committees should make a careful study of the problem in its particular State, with special reference to the feasibility of organizing definitely a department of college extension.

(3) We request that, if sufficient funds are available, the Office of Experiment Stations print a report, at as early a date as convenient, which shall embody in more detailed form the results obtained in the present investigation through the inquiries sent out by that Office. We believe that the facts collected should be issued in printed form and that this publication should be placed in the hands of the officials of all of the institutions and agencies which are now doing or which ought to do extension teaching in agriculture. To that end we would advise a large edition of this pamphlet for wide circulation by the Department of Agriculture.

All of which is respectfully submitted.

KENYON L. BUTTERFIELD,
CHARLES R. VAN HISE,
CHARLES F. CURTISS,
ANDREW M. SOULE,
W. M. HAYS,
B. W. KILGORE,

Committee.

W. A. Henry, of Wisconsin, moved "that it is the sense of the association that the report of President Butterfield be printed at an early date by the Department at Washington."

The motion was seconded and adopted.

RESOLUTION REGARDING AGRICULTURAL EXTENSION WORK BY THE OFFICE OF EXPERIMENT STATIONS.

K. L. Butterfield, of Massachusetts, submitted a resolution on this subject which, after some discussion which developed opposition to "authorizing" or "instructing" the executive committee to work for an appropriation for the purpose named, was adopted in the following (modified) form:

Whereas we believe that the Office of Experiment Stations of the Department of Agriculture should be given an adequate appropriation for the distinct purpose of investigating, in a much more thorough manner than is now practicable, the details of the various forms of agricultural-extension teaching already in vogue, of assisting the different institutions to organize this form of work somewhat comprehensively, and of widely disseminating information and suggestions relative to new developments in this most important form of agricultural education: Therefore, be it

Resolved, That this association favor an appropriation by Congress which will enable the Department to carry out the work suggested.

A. C. TRUE, of the Office of Experiment Stations. As a matter of information I would like to state the exact condition of things with reference to this matter in the Office of Experiment Stations. We have had for a number of years an appropriation of \$5,000 for work relating to the farmers' institutes. Last year the Secretary of Agriculture took up this subject more broadly, asking Congress to increase the authority of the Department so that it might investigate and report on agricultural schools as well as farmers' institutes, and for that purpose he asked for an increase in the appropriation. This matter was taken up at the last meeting of this association, and the executive committee was

instructed to favor that proposition. The chairman of your committee appeared before the Senate Committee and spoke strongly in behalf of the measure. The House, in the meanwhile, had refused to grant the request of the Secretary, and fixed the appropriation just as it had been in previous years. The Senate, influenced, I have no doubt, largely by the request of this association, granted both the increase of authority pertaining to the scope of our work so as to include agricultural schools and the increase of appropriation. Then, of course, the matter had to go to conference, and in the final outcome we were granted the authority to do the work, but not the increase of appropriation. Meanwhile it appears that friends of agricultural education in the country, who include, of course, many members of this association, have got it into their heads that we are to do this work, and seem to have overlooked the fact that we do not have any more funds to work with; so in the last six or seven months we have been simply flooded with requests for additional efforts in various lines, and it is absolutely impossible for us to do the work without more money.

Perhaps I ought to add that the way in which the matter will come before Congress in the first instance, at any rate, will be through the estimate already submitted by the Secretary of Agriculture. This does not propose to change any existing legislation. The general terms of the bill will be the same, and will authorize the Secretary of Agriculture to investigate and report on agricultural schools and farmers' institutes, and suggest better methods for the utilization of these agencies in the dissemination of information obtained by the stations. The only new thing that will be brought to the attention of Congress is the increase of the appropriation for that purpose, and the Secretary has recommended \$20,000 next year, instead of \$5,000, as appropriated at present.

The Secretary of Agriculture is supporting this matter very cordially. He sees very clearly the interests involved, and we may depend upon his doing all he can. Anything that substantially puts this association behind the movement of the Secretary to increase our appropriation will be useful to us.

REPORT OF COMMITTEE ON EXPERIMENT STATION ORGANIZATION AND POLICY.^a

E. Davenport, of Illinois, submitted the following report:

When the standing committee on station organization and policy was appointed at the Washington meeting a year ago there seemed little work for the committee to do, and it was decided best not to force work, but allow matters to develop and take up such questions as might from time to time arise.

I. THE ADAMS ACT.

In March, when the passage of the Adams bill seemed to be assured, Director True, of the Office of Experiment Stations, wrote the chairman of the committee that a number of questions as to the policy of stations in the expenditure and use of this new fund would be much discussed in the near future, and on some of these matters the Office of Experiment Stations would have to take action as representing the Secretary of Agriculture in the administration of the Adams Act. He suggested, therefore, that the committee be called together to take such action as might seem desirable. Accordingly, a meeting of the committee was held at Chicago April 7. Directors Davenport, Scovell, Thorne, and Woods, of the committee; Doctor Babcock (representing Director Henry), and Director True and Assistant Director Allen, of the Office of Experiment Stations, were present, the last three on invitation of the committee.

The committee found itself in accord with the Office of Experiment Stations in regard to the general scope of investigations that can properly be undertaken under the Adams Act. There has been during the year the most cordial relation and a very complete understanding between the committee and the Office of Experiment Stations in regard to the policy to be pursued, and the committee heartily indorses the letters and circulars of the Office relative to the Adams Act.

^a See also U. S. Dept. Agr., Office of Experiment Stations Cir. 71.

Among the problems under consideration by the committee are—

(1) How can unnecessary duplication of work be avoided?
 (2) How can continuity of effort be better insured, and rapid changes in station officers be avoided?

(3) What are suitable lines of investigations to be taken up under the Adams Act?

To gain as much light as possible on these and similar points, the following letter was sent to the directors of the various stations:

"The committee on station organization and policy desires to collect information upon the following topics:

"(1) The character of experiments that ought to be undertaken under the Adams Act.

"(2) How to prevent undue competition (between stations) so far as men are concerned.

"(3) How to best reach boards of control.

"(4) What influence can be exerted to prevent sweeping and disastrous changes in station organization?

"(5) The relation of the work of the United States Department of Agriculture to that of the stations."

A large number of replies were received and have been carefully considered by the committee at numerous meetings held at Baton Rouge before and during this session of the association. At the request of the committee, Doctors True and Allen have met with and greatly assisted the committee in their labors.

It speedily became evident that it will of necessity be a matter of years before a perfectly satisfactory working out of the relations of the station to the Adams Act can be accomplished.

The local conditions surrounding the stations, both as to environment and personnel, make it impossible to hope that at the beginning it will be always possible for a station to take up lines of investigation of the high type it is hoped that all the stations may ultimately attain.

Even at the risk of wearying the association it seems wise to outline as briefly as may be some of the difficulties found in the way of clearly defining the relations of the station to the Adams Act.

In the abstract everybody agrees with the purpose of the Adams Act and the desirability of restricting the fund closely to original investigations. When we come to concrete cases, however, there is a very great difference of opinion. It must be said that there are indications of a certain unreadiness for research of the true type. The difficulty is in a sense a fundamental one, but grows to a considerable extent out of a habit of mind. Many of our station workers see only the immediate duty of the station to the local farmer of to-day. They forget that the station has a duty to all phases of agriculture in a broad sense, in order that its labors may lead to much more permanent and widespread benefit.

The greatest difficulties at the present time, as disclosed by conversation and correspondence with experiment station men, are (1) a lack of clear discrimination between investigation in a strict sense and ordinary experimental work; (2) a lack of definiteness in the purpose and plan of the investigations; (3) a tendency to take up too large or broad problems; and (4) the outlining of too large a number of projects.

As indicating the first difficulty, take the milking machine for example. At least a dozen stations have purchased milking machines, or plan to do so, with a view to making what they designate as investigations of the use of that machine. In several cases the plan of work as outlined merely contemplates the comparison of the machine with hand milking as regards yield of milk, composition, and cost of operation. In several other cases the effect of machine milking on the bacterial content and general sanitary condition of the milk is included, and in at least one other case the investigation is extended to different types of machine and is to include the mechanical construction and the effect of continued use upon the cow.

Obviously a great deal will depend in this line of work upon the mental attitude and ideals of the man in charge of it. It may easily degenerate into something quite analogous to the tests of separators and other dairy machinery which were so popular a few years ago and which, useful as they were, could hardly be regarded as investigations or research.

Perhaps more projects have been proposed in plant breeding than in any other subject, and these are of great variety. They may be classed somewhat roughly as follows: (1) Those which aim at "improvement" in a vague and indefinite way; (2) those which propose improvement and adaptation along

rather more definite lines by means of selection, these selections to be made from the crops grown under field conditions, the poorer groups being eliminated rather than the superior individuals selected; (3) systematic breeding and selection, starting from the individual, according to the method used by Professor Hays at the Minnesota Station; (4) breeding or selection for resistance to disease, insect attacks, hardiness, etc., in which individuals are selected here and there and the attempt made to perpetuate the desirable traits and at the same time to keep up the general quality by crossing with approved varieties; (5) improvement through crossing and hybridizing, to be followed by systematic and rigorous selection; and (6) breeding experiments undertaken primarily to test the application of recognized theories, to study correlations of vegetative parts with certain qualities, and to secure a basis for generalizations on the principles of breeding.

These different classes manifestly differ widely in their character and their value, from a scientific standpoint. What classes of this work should be properly regarded as investigation, and where should the line be drawn between the work of the plant breeder as an expert on the one hand and that of the seedsman and nurseryman on the other? The stations have shown the possibility of improvement along lines which were not thought feasible, have produced a considerable number of valuable strains of varieties, and have contributed toward the methods in this line of work. The question arises, Should they go on improving and adapting our common field crops to local conditions and special purposes, and regard this as scientific investigation; or should these specific improvements be left to the commercial man and the more intelligent farmer, while the station devotes itself to some of the more difficult phases of breeding, and to trying to develop some of the principles and fundamentals which will be of broad application and will tend to make our breeding more sure and less hit-and-miss than at present?

In feeding we find (1) experiments proposed which in themselves amount merely to the ordinary comparison of different foods and rations, in short-period experiments, and upon that indefinite thing designated the management and handling of feeding stock; (2) isolated digestion experiments made merely to add to our fund of data; (3) experiments to study the effect on digestibility and the utilization of food, of certain specific feeding stuffs, and the combinations of different classes of feeds; (4) experiments made in connection with analytical studies and digestion experiments, to study the nutritive values of various feeds, the animal being the measure in such cases; (5) studies of the specific effects of different kinds of feeds, as certain grains and by-products, upon the qualities of milk and dairy products, the limit of cotton-seed-meal feeding to pigs; and (6) studies of the effects and functions of particular constituents, as the ash and the protein, the protein requirement, metabolism of nutrients, and the theory of animal nutrition in general.

Instances might be multiplied and extended to all branches of agriculture which show a great difference of opinion as to what constitutes research, and mark every gradation from isolated experiments of purely practical import to investigations of the most abstract character. They indicate that the subject needs careful and detailed study and can not be disposed of offhand. One difficulty lies in the complex character of our agricultural problems. They have not been subdivided and classified as in the case of the pure sciences, and in many cases our work is inconclusive and does not bring our knowledge up to a definite point or stage. In a sense it has been unsystematic, leaving our knowledge so fragmentary that there is often difficulty in determining whether a given topic is an original one or not.

At the present time your committee finds it impracticable to lay down specific lines along which the Adams fund may be properly expended, and limits its recommendations to those of a general nature, leaving the more detailed statements to a later time.

Perhaps the following statement, adopted at the Chicago meeting, sets forth the ideas of the committee as tersely and clearly as is at present possible:

It is evidently the intention of the Adams Act to provide the means for carrying on investigations of a relatively high order with a view to the discovering of principles and the solution of the more difficult and fundamental problems of agriculture. To this end it is very desirable that careful attention shall be given to the choice of definite problems to be studied and the methods by which the solution of these problems is to be sought. Investigations in connection with which there is good reason to expect the establishment of principles of

broad application should be preferred to those which have only local or temporary importance or from which only superficial results are to be obtained.

The ideal college should be symmetrical, in that it is equally developed in all lines. A station need not be symmetrical. One or two strong departments are better than many weak departments. In selecting the lines of work due reference should be given to the special needs of the State in which the station is located, but the lines of work adopted should be only such as have a reasonable expectation of leading to the establishment of principles of broad application. These lines of work need not be new lines. Indeed, strengthening lines of investigations now in progress may be fully as important as the establishment of new lines.

At the present time we must confine ourselves to general principles in selecting the line of research to be taken up under the Adams Act.

To be sure that these lines are in the scope of the Adams Act, it will be necessary for the station administration to clearly understand what constitutes research.

Only a few lines can be advantageously undertaken at a time. What these lines of investigation shall be must be determined chiefly by the equipment of the station in men and facilities.

The man is the most important factor. If the station already has the man, the line of investigation must be one to which he is adapted by mental aptitude, education, and training.

If the station is to employ a new man, a wider range in choice of subjects might be possible. But in any case the man and his line of work must be suitable to each other. In the search for men it may not always be possible to find men among the graduates of the land-grant colleges of broad enough training to make ideal investigations. It is more important that a man be thoroughly educated in the fundamentals of science than that he be trained in some of its applications. For example, if a station is to investigate problems in soil physics it is more important that the man be well educated in the fundamentals of physics than that he should have had a course in agricultural physics such as is usually taught in agricultural colleges. This follows from the fact that the thoroughly trained physicist can speedily acquire the known facts in soil physics, while the man merely trained in soil physics hopelessly lacks the basal knowledge of the science.

After suitable lines of work are decided upon, all payments for salary and labor and purchase of apparatus, tools, books, and other material necessary to carry out this problem are allowable.

II. ORGANIZATION.

In view of experiences not unknown in the past and likely to be repeated from time to time in the future, your committee feels it not unwise to call attention to certain fundamentals in organization that seem sometimes to be forgotten or overlooked, but that bear with irresistible force upon the efficiency of experiment stations as agencies for research.

(1) Regarding the relation between boards of trustees and station officers: The function of boards of trustees is legislative, while that of station officers is executive. Boards adopt plans and station officers carry them out. These two functions are mutually exclusive and do not overlap. If proper distinctions are kept in mind as to the fundamental difference between ordering a thing done at public expense, which is a legislative act, and the carrying out of that order, which is an executive act—if this distinction be kept in mind, there need be no confusion as to mutual responsibilities and duties on the part of station officers and boards of trustees.

Manifestly the determination of a new policy of wide and general application or the fixing of a new principle of procedure is a deliberative act which nobody but a board of trustees is competent to undertake. On the other hand, to carry out a plan or policy to a successful issue—to meet and handle all details and to use them to that end—these are executive acts for which only executive officers are competent.

The committee is of the opinion that failure to observe this fundamental distinction is the frequent occasion for station officers proceeding with insufficient authority on the one hand, and upon the other of attempts on the part of the boards of trustees or of their members to become involved in administrative details that belong only to station officers. The first is certain to lead to

censure if not ultimately to sudden and sweeping removals; the second makes the position of station officers intolerable. Your committee is clear upon this point, viz, that any confusion as to mutual responsibilities and duties as between boards of trustees and their employees is fatal, not only to efficiency of service, but ultimately to the organization itself.

(2) Regarding the source of authority: The authority of an officer, whether legislative or executive, arises out of the nature of his responsibilities, and the imposing of that responsibility by any competent body carries with it sufficient authority for all acts necessary to its discharge. But no officer is competent to act except within regularly constituted channels. For example, a director has no right to assume the duties of a subordinate. In the discharge of his duties he must act as a director, not as another officer. Similarly, an individual who is a member of a board of trustees is competent to discharge his functions only in regular session. The authority of the board resides in the body as a whole, and not in its individual members, unless they have been directed to act for that body in a special matter. All this is aside from the fact that it is not only important but necessary to intelligent performance of their duties that members of boards of trustees familiarize themselves with the details of station work and needs.

(3) Propriety in relation between employer and employed: It is manifestly inconsistent for the same individual to hold an administrative position in a station and at the same time be a member of the board of trustees. It not only establishes the absurd situation of a man enacting the laws under which he himself shall afterwards serve in a public capacity, but it undermines that feeling of confidence and personal security on the part of his associates that is known to be necessary to good and efficient service.

(4) Tenure of office: Reasonable security of position, at least among men who have now a fair right to honorable standing among their fellows—all this is so manifestly essential to even fair efficiency that your committee ventures to express the conviction that to subject faithful station officers to the ordeal of annual reappointment is not only unnecessary to the securing of efficient service, but it is disturbing to individuals, tends to prevent the formation of plans and policies looking to the highest stability, and is positively dangerous to the integrity of the organization.

The committee is in possession of a mass of material bearing upon a variety of questions of more or less personal interest and which it reserves for future report, mentioning at this time only the matters that seem of most importance at the moment.

All of which is respectfully submitted.

E. DAVENPORT,
C. D. WOODS,
W. A. HENRY,
H. J. WATERS,
M. A. SCOVELL,
C. E. THORNE,
Committee.

ADDRESS OF ASSISTANT SECRETARY OF AGRICULTURE.

Assistant Secretary W. M. Hays, of the U. S. Department of Agriculture, was called upon and spoke as follows:

MR. PRESIDENT: I am glad to be here, even though I am late. I am glad to be here in particular because of the inspiration that comes from such a body of men. This is one of our mighty organizations. This great movement, which had its beginning but a few decades ago, has gained impetus so rapidly that I fear we hardly realize what is coming. The amount of expenditures in agricultural research to date and the amount promised to be spent in the near future are significant. Approximately \$25,000,000 have been spent in America in the last twenty years for agricultural research, and presumably a like amount in other countries. Even larger amounts are being expended for teaching agriculture and other industrial work. The amounts which are now being appropriated for agricultural research, agricultural school work, and agricultural extension work make it look as if in twenty-five years at least a quarter of a billion dollars will have been spent in agricultural research and a much larger amount in industrial education.

The body of knowledge that has come to agriculture from research work is coming to be so stupendous, so intricate, and so valuable that it is bound to

make for itself a very large place in our educational system. The members of institutions represented by this association should take a larger part in framing up the plans for education in the respective States. We are inclined too much to leave this work to the so-called professional educator, whether he be in an official position as a State superintendent or at the head of a school of pedagogy. The experiences of the teachers of industrial work in our agricultural and mechanical colleges have placed them in position better to see how to reorganize our school system on a more practical basis for the workers, whether they be farmers, toilers in the city industries, or home makers.

Some of the things developed from necessity in the Department of Agriculture, which is much the largest organization sending delegates to this association, ought to be of interest to those interested in the administration of agricultural colleges and experiment stations. I wish at this time to mention one thing as illustrating the fact that some of the details of the larger organization may be more generally used.

As the business of the colleges and experiment stations grows in volume the presidents and directors need to find ways of lessening the detail work to which they must attend. The system developed at Washington of initialing letters which should be signed by the head of the institution, but need not be written by him, is worthy of investigation. A great many of the letters signed by the Secretary of a Federal Department are prepared by bureau heads or by other bureau officials or division officers. Some of these are initialed by the bureau heads and some are not. Some of them have on them the initials of a division head as well as the initials of a bureau head. Still others have only the initials of a division head, as each bureau may arrange. This plan makes it practicable for the man who is in most intimate touch with the subject-matter of a given subject to write the letter, thus giving the chief who must sign the letter the advantage of the technical information of the one who writes it. This plan is an advantage to the person who writes the letter, because it enables him to be conversant with and to aid in guiding the project at every point. It gives the executive officer a chance to direct, check, or change statements in line with the general policy without taking much of his time. It gives to the writer of the letter a chance to have his work constantly authorized by signatures. The fact that recipients of these letters know from the initials who really write them is in practically all cases a decided advantage. Under this scheme trusted clerks can distribute much mail upon its receipt directly to the persons who are to prepare replies, thus greatly facilitating business.

GENERAL RESOLUTIONS.

After adopting resolutions of thanks for courtesies and favors received the convention adjourned sine die.

MINUTES OF THE SECTIONS.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

AFTERNOON SESSION, WEDNESDAY, NOVEMBER 14, 1906.

The section was called to order at 2.30 p. m. by Chairman C. R. Van Hise, of Wisconsin.

The first address presented was one by D. B. Purinton, of West Virginia, as follows:

RELATION OF THE LAND-GRANT COLLEGE TO THE PUBLIC SCHOOL SYSTEM.

The theme assigned me is both comprehensive and important. It involves both the principles of educational philosophy and the practices of educational life. Its terms can not be easily misunderstood. By "land-grant colleges," I take it, are meant those institutions in the various States and Territories which receive the benefit, in whole or in part, of the so-called land-grant acts of 1862 and of 1890, by which the Congress of the United States appropriated some eight or ten million acres of the public domain to purposes of higher education. By "public school system" is meant that provision made by law in each of the States and Territories for the education of its youth at the public expense, in whole or in part. It includes the district school—graded or ungraded—the grammar school, the high school, the normal school, and, in some cases, the manual training school. Possibly it may likewise include some schools of a professional or technical character.

The land-grant college is in every case the joint product of the Congress of the United States and the legislature of a given State—that is, of the nation and the State combined. The public school system is the creature of the State alone. The relation of these two must therefore be essentially a thing not of the nation but of the State. Both institutions are managed and controlled by the State, the national element in the college being merely incidental.

But the question of this relation which we now seek involves the more fundamental question of the relation of the State to the subject of education in general. Has the State duties concerning the education of its citizens; and if so, what duties? The first of these questions, I take it, need not be seriously considered. For, whatever may have been the opinion of our fathers, the logic of events has convinced us that the State must, in some real sense, care for the proper education of its youth. The second question is not so easy. Concerning the character and extent of this duty citizens equally intelligent and patriotic entertain radically different opinions. This difference is to be expected from the very nature of the case.

In the judgment of the present writer, the State has four distinct obligations in the matter of education:

- (1) To see that every child in the State is so educated as to prepare him to be a good citizen. This includes both the right and the duty of compulsory education if necessary.

- (2) To provide and support such schools, and in such numbers as to give adequate and universal opportunity for education for good citizenship. This means public schools for all those who have no other available agencies of education.

- (3) To supervise all schools, whether private, or corporate. Private citizens, guilds, churches, and corporations may properly enter the educational field, but they may not do as they please in that field. For instance, they may

not teach doctrines hurtful to the State, such as polygamy, anarchy, or treason. To permit such teaching would be suicidal folly on the part of the State.

(4) To secure for citizens who are to become special functionaries of the State ample opportunity to make special preparation for such service of the State. This fourth proposition has been strenuously contradicted in some quarters. And yet I think it is correct. I should not go to extremes in this matter as in Plato's Republic, for example, in which every State official was to have been substantially under the educational control of the State from his eighth to his fortieth year. But I do insist that the State secure for its future officials and responsible leaders such educational advantages as may be necessary to make them competent to fill their respective places. It is on this principle that normal schools and other technical and professional schools are to be justified. Nothing less than this will insure the life and prosperity of the State itself. To be sure, these advantages need not be actually provided by the State in case other provision can be found, but the State must see that they are provided.

I have dwelt somewhat upon this principle because, as it seems to me, it is essential to the right understanding of the true relation—or, indeed, of any relation at all, for that matter—between the land-grant college and the public school system. If the State has neither the duty nor the right to furnish more than the simple rudimentary education necessary for private citizenship, as some educators contend, then the land-grant college can have no conceivable relation whatever with the public school system. Indeed, it can have no excuse for existing.

The public school has been euphemistically called "the people's university." Now, that is just what the land-grant college really is, or, at all events, really ought to be. That is to say, the main purpose of the land-grant acts was to bring liberal learning within reasonable reach of all the people. That it was to provide liberal learning is made sufficiently evident in the following words found in the act of 1862: "In order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life. Not excluding classical studies." Now, the type of education set forth in these words is practically the same as that found in the ordinary American college or university. That this education was to be for all the people is seen in the words of Senator Morrill, author of the two bills, who declared their purpose to be "to enable the industrial classes of the country to obtain a cheap, solid, and substantial education, and to get it when they could not in any other way, because of the cost of the classical schools of the country." These are great and gracious words. The legislation to which they refer is positively unique and epoch-making in the history of education. For the first time in the world's history we see a great nation making general and generous provision for the highest education of its lowest citizens. Thenceforth the poor man's son is to have equal chance with the rich. It was never seen on this fashion before. Hitherto university education had been so expensive as to cut out the poor. It is still so as a rule in universities of the old type.

A good illustration of the situation has recently come to the notice of American educators in connection with the University of Oxford, England. The holders of the Cecil Rhodes scholarships are notified beforehand that the \$1,500, which is the annual amount yielded by each scholarship, is barely sufficient to pay the necessary expenses of a year's residence at Oxford. The case is quite different with students of our American land-grant colleges. These colleges, with their small fees, their free tuition, and their absence of expensive and luxurious traditions, reduce the necessary expenses to one-fourth of the amount named above. This is altogether as it should be. And this fact alone connects these colleges in a vital way with the public school systems of the States in which they are respectively located. Indeed, they belong to the systems themselves. The land-grant college is but the last link in the educational chain, the highest rung of the educational ladder which any ambitious youth of the State may hope to climb.

If this be the true relation which is under discussion, it involves certain definite obligations which should be recognized in the management of these colleges. A few of these obligations may be properly mentioned—

(1) Tuition should be free to all students resident in the State, or as nearly so as conditions will permit. Other institutions are at liberty to charge large fees if they like, but these can not do so without practically defeating the purpose of their establishment. Of course due care should be taken to prevent the abuse of this provision by nonresident students.

(2) The curricula of studies should be such as to meet the wants of the people at large. Other institutions may properly confine their work largely to the classics and the cultural studies if they wish, but land-grant colleges should have regard to what the people want to know and to do. Technical and practical studies should be emphasized. What special branches should be made prominent in each State should be determined by the special needs of that State. In a State largely agricultural, the department of agriculture should receive primal attention. In a State rich in minerals and mining operations, where new towns are springing up and new railroads being constructed, the college of engineering should be made specially strong. Studies in law, medicine, pedagogy, music, art, etc., should in like manner be made to meet the legitimate demands upon them.

(3) All public high schools and preparatory schools in the State should be accredited or approved by the college, in so far as their work is worthy of approval, so that good students upon completing their studies in the secondary schools may find a natural entrance to their college life unobstructed by terrific and terrifying examinations. There is no good reason why a timid freshman, just at the very critical period of his first severe attack of nostalgia, should be confronted with four years of his educational past, any more than that a bumptious sophomore or a self-satisfied senior should be so confronted. Nay, verily; if such an exaction of exotic examinations should be made at all in college life, it should be required from the upper-class men, rather than from the freshman.

(4) A close, intimate, and friendly relation with secondary schools should be maintained by the college. This may be done by means of an inspector, a field agent, a faculty committee, or by all these combined. But by every possible means the college should stimulate the secondary schools to be worthy of the relation which they should sustain to the college. We are told that every good and perfect gift cometh down from above. And this is true in education as in religion. All educational history proves that the best things for progress and perfection have been handed down to the lower schools from those which are above. Accordingly, the average high school is not pushed higher by schools beneath it, but pulled higher by schools above it. This pulling process the land-grant college should regard as a part of its legitimate business.

(5) The land-grant college should stand for the best ideals in education from top to bottom. By its own example of thoroughness and sincerity it should inspire the entire public school system to be what it claims to be, to do what it pretends to do, and to avoid the very appearance of intellectual or educational dishonesty. As a rule these colleges are better equipped than other like schools in their respective States. This fact gives both the ability and the obligation to be altruistic and missionary in spirit and aspect. Representatives of the college should, as far as possible, attend teachers' institutes, grange meetings, boards of trade, improvement leagues, church conventions, and the like, and should so conduct themselves as to find a hearty welcome at all such gatherings of their fellow-citizens.

(6) The land-grant college should make higher education as attractive as possible to the average citizen. It may be frankly admitted that this average citizen is himself not a very attractive personality. Apostles of culture like Pythagoras and Matthew Arnold may quite naturally despise him. Even Plato may disparage him. But the genius of modern civilization is distinctly in his favor, and the sanest theory of evolution attributes the raising of the type to the development of the individual under the type. It is for America to show the world that the average man may receive at least a fairly liberal education. It is for the land-grant college to translate the conditions of culture into available terms of ordinary human life. In its relation to the public school system it is simply to complete the work already begun, to mature the fruit already produced, to gratify the ambition already inspired, to make of the average man who wishes it a strong, capable, useful, high-minded, broad-visioned citizen. So shall it be in deed and in truth the "people's university."

A single reflection may properly close this paper. It is admittedly not exactly on the subject, but it seems pertinent thereto. The reflection concerns the marvelous growth, within recent years, of the State university in this country. The pertinence of the reflection will appear from two considerations: First, in many of the States the State university and the land-grant college are one and the same. Second, in practically all the States the State universities have imbibed the educational spirit, accepted the educational philosophy, and adopted the educational policy of the land-grant acts. In 1862, when the first of these acts became law, the State university was scarcely counted among the educational forces in this country. The corporate and denominational institu-

tions were doing most of the work. Since then these institutions have grown immensely. Even the oldest of the corporate universities have more than doubled, and in some instances quadrupled their plants, their endowments, and their student bodies. New institutions have entered the field with their multiplied millions. The churches have bestirred themselves. The Baptist Church, for instance, within the period mentioned, has invested nearly \$50,000,000 in plants and endowments for higher education. Methodists, Presbyterians, and others have been similarly active. Even the smaller and weaker religious bodies have caught the contagion. One of them, for example, whose communicants in the entire country, number less than 20,000, is supporting three colleges—one in New York, one in West Virginia, and one in Wisconsin.

But, strange to say, in the midst of all this varied and vigorous educational activity, the State university has come to the front with unexampled rapidity. There are now in the United States 50 institutions having a thousand or more students each. Half of these are State institutions. Eight universities have about 4,000 students each. Four of these are State universities. In the aggregate these State institutions have a body of 5,000 instructors and nearly 75,000 students. It is entirely safe to say that no other class of institutions is doing more or better work. Now, these remarkable educational facts may be variously explained, but, in my judgment, both this phenomenal growth of the State universities and the great educational awakening of which it is both an element and an evidence are due to the influence of the land-grant acts more than to any other single cause, possibly more than to all other causes combined. The recent unprecedented progress of popular and liberal learning owes vastly more than we are apt to think to the land-grant colleges of America.

Following this address there was general discussion of the topic, special attention being paid to the rural schools and the preparation of teachers for these schools and the extension of the teaching of agriculture into the rural schools and high schools. Special interest was shown in the subject of the introduction of agriculture into the common schools.

B. O. Aylesworth, of Colorado, discussed the relation of normal and public schools in Colorado, and stated that an effort would be made to pass a bill requiring agriculture to be taught in the public schools of that State.

Several of the delegates reported that this had already been done in their States, and there was considerable discussion of the advisability of this means of introducing agriculture into the country schools, the consensus of opinion seeming to be that legislation on this subject is not wise, because it is likely to be ineffectual on account of the lack of preparation of teachers. Teachers must be first trained to teach agriculture before compulsory instruction is advisable.

C. R. Van Hise, of Wisconsin, stated that in his opinion no course a student of average ability can take is as certain of results as the course in agriculture.

The subject was further discussed by E. B. Andrews, of Nebraska; A. B. Storms, of Iowa; E. A. Bryan, of Washington; K. L. Butterfield, of Massachusetts; J. L. Snyder, of Michigan; H. C. White, of Georgia, and Brown Ayres, of Tennessee.

R. W. Stimson, of Connecticut, presented the following address:

STUDENT LABOR.

Is student labor to-day a vital subject?

Let us first get our bearings.

The Scylla and Charybdis of the land-grant colleges are the danger, on one hand, that their training will be too liberal, and the peril, on the other, that it will be too practical. It is well recognized that where two elements of training must be included one may be made to prevail at the expense of the other.

There can be no doubt as to our double duty. The Morrill Act of 1862 prescribes that "without excluding other scientific and classical studies, and including military tactics," we shall "teach such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." The Morrill Act of 1890 is no less explicit. It provides for education in "agriculture, the mechanic arts, the English language, and

the various branches of mathematical, physical, natural, and economic science, with special reference to their application in the industries of life." Pure culture and culture applied, pure science and science applied, were equally prescribed.

If any one man possessed divine right to expound the meaning of the text of these acts, certainly it was the founder of the land-grant colleges himself. Pressed for an interpretation, Mr. Morrill urged that the object of these colleges was—

"To give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and the mechanic arts, such as they could not then obtain at most of our institutions called classical colleges, where the languages, Greek and Latin, French and German, absorbed perhaps two-thirds of all the time of the students while in college.

"But," he continued, "it never was intended to force the boys of farmers going into these institutions so to study that they all should come out farmers. It was merely intended to give them an opportunity to do so, and to do so with advantage, if they saw fit.

"Obviously," he said, "not manual but intellectual instruction was the paramount object. It was not provided that agricultural labor in the field should be practically taught any more than that the mechanical trade of a carpenter or blacksmith should be taught. Secondly, it was a liberal education that was proposed. Classical studies were not to be excluded, and therefore must be included. The act of 1862 proposed a system of broad education by colleges, not limited to a superficial and dwarfed training such as might be had at an industrial school, nor a mere manual training such as might be supplied by a foreman of a workshop or by a foreman of an experimental farm. If any would have only a school with equal scraps of labor and of instruction or something other than a college, they would not obey the national law. Experience in manual labor, in the handling of tools and implements, is not to be disparaged; in the proper time and place it is most essential, and generally something of this may be obtained either before or after the college term, but it should not largely interfere with the precious time required for a definite amount of scientific and literary culture, which all earnest students are apt to find far too limited."

Mr. Morrill spared no pains in efforts to make his meaning clear. On another occasion he said:

"Something more than a blackboard and a piece of chalk is wanted. A laboratory with an extensive stock of chemicals, scientific instruments and apparatus, libraries, museums, mineralogical cabinets, military halls and gymnasiums can not be had without expense, but they also are prime necessities. * * * The branches of scientific learning have been greatly multiplied and expanded in modern days, and there is a public and progressive demand for them which these colleges must supply at whatever cost."

Another element indicative of the character of the land-grant colleges should not be overlooked. According to Senator Morrill's conception, not only were the land-grant colleges to be "higher institutions of sound learning," not only would he wish to "multiply them tenfold and especially multiply such as grapple with practical affairs of everyday life and are—

" * * * not too * * * good
For human nature's daily food,"

but he would also have them open to the poor. This idea seems to have been carried out to his entire satisfaction, for in 1890, when his bill was brought up in the Senate for debate or passage, Mr. Morrill took occasion to say:

"The land-grant colleges are institutions that do not lift the cost of their instruction out of the reach of the many nor generate habits of profuse expenditure, and are healthy homes for students, especially for those destitute of hereditary resources, who look only to a life of honorable effort and labor."

Made possible by these acts of Congress, their purpose explained in such unmistakable terms by their original promoter, evidently the late President Atherton, whose presence we sorely miss to-day, was speaking with the fullest warrant when, just six years ago to-day, in his notable address at the New Haven convention, he said that the land-grant colleges possess "a charter broad enough to cover the whole range of learning." And we may well find inspiration in President Atherton's prediction that, close as they are to the needs of the great mass of our common people, "The future of higher education in this country belongs largely to these colleges and to the influences they have created and must continue to create."

In general it may safely be said that the vicissitudes which our institutions have encountered have not been due to the fundamental Federal law; they have been due to local leanings, practices, and even prejudices. The several States have been left largely alone to interpret the law and to carry out its provisions, according as their legislatures might respectively prescribe. Most of the pilots have sailed their courses by charts derived from local soundings. The wonder is not that there has been so much, but that there has been so little wreckage. Here an institution has veered too far toward a liberal education; there one has pressed too close to the practical. It is when we begin to examine local conditions that the vital nature of the subject, "Student labor," now specifically before us, becomes evident.

By student labor it is understood that we mean compulsory manual labor performed during term time in the various branches of agriculture at the college and paid for by the college. Starting, as our colleges started, with no definite policies adopted and with no precedents established, the question which confronts us is: How did student labor come to be made compulsory?

Speaking for Connecticut, and leaving the motives operative in other localities to be brought out in the discussion which may follow, I should say that the main motives appear to have been two: (1) Desire to make the net cost to the student of the new education moderate, and (2) desire to make this education practical.

In Connecticut the first institution to benefit by the land-grant college movement was Sheffield Scientific School, a department of Yale. Looking over some old documents not long ago, I found a copy of a letter addressed to the faculty of Sheffield Scientific School by one of its members, Prof. John Addison Porter, which throws a most interesting light on the early local situation. Professor Porter said, in part:

"It is to be borne in mind that the fund referred to is to be used for the 'instruction of the industrial classes;' that is, of men and the children of such men as work with their own hands in agricultural or mechanical employment. This class of persons has not, hitherto, resorted to the scientific school.

"The length and character of the courses and the large expense of residence in New Haven have precluded the possibility of this save in a few exceptional cases. Neither the increase of the salaries of the professors (in itself certainly a most desirable object) nor the employment of new professors will adapt the institution any better to the wants of the class referred to.

"The case would be different if a portion of the fund were devoted, as in some other States, to defraying the expenses of students, or if by the location of the school on a farm or the provision of workshops the opportunity were afforded to students of defraying by their own labor at least a portion of the expenses of the course. By this means the expenses of a student at the Michigan Agricultural College are reduced to less than \$100 per annum.

"As no such provision is here made for defraying or diminishing the expenses of students except by the remission of their fees, it is very obvious that this sine qua non of cheap education for the industrial classes can only be realized in the Sheffield Scientific School by the introduction of short courses of study attended with proportionately small expenses.

"As we have taken upon ourselves the responsibility of bringing the agricultural college fund to the Sheffield Scientific School, or at least accepting it from the State, the obligation is imposed upon us of thus adapting our institution to the necessities of the class for whose benefit the fund was granted by Congress. In this view I understand the faculty to be agreed."

Yale held the so-called "agricultural fund" for twenty-eight years, with the following results; Bachelors of philosophy, 263; short-time students, of what not known, 107; or a total of 370 students, of whom the whole number of agricultural graduates, from Connecticut and elsewhere, was only 13. This 13 appears to have been indeed an unlucky number for, by act of the general assembly and after bitter litigation, Yale lost the fund.

Meantime, an agricultural school had been established by the State, with the aid of private benevolence, at Storrs, 65 miles distant from New Haven, the object of which, as determined by the act establishing it, was the education of boys whose parents were citizens of Connecticut in such branches of scientific knowledge as should "tend to increase their proficiency in the business of farming." The school had been modeled closely after the Ontario Agricultural College, at Guelph. Compulsory student labor had been made one of its essential features. To this institution, raised to the rank of a college and amplified in its curriculum by the addition of departments of mechanic arts and

domestic science, the fund which Yale had received was diverted. This institution, now known as the Connecticut Agricultural College, has since received all the income from the Morrill funds and has been the sole representative in Connecticut of the land-grant college movement. Three hours a day of manual labor, paid for at 8 cents an hour or less, according to proficiency and to good or bad behavior, and required of all students during the entire course, was a prominent part of the heritage received by the college from the old Storrs School and was preserved as a sacred custom. It was known that this student labor made the cost of education to the students cheap; it was alleged that it made their education practical. By many it was considered vital to the purpose of the new college.

Sheer growth in numbers is understood to have forced the abandonment of compulsory student labor in some of our colleges, it having become impossible to provide work for, and direct the work of, so many students.

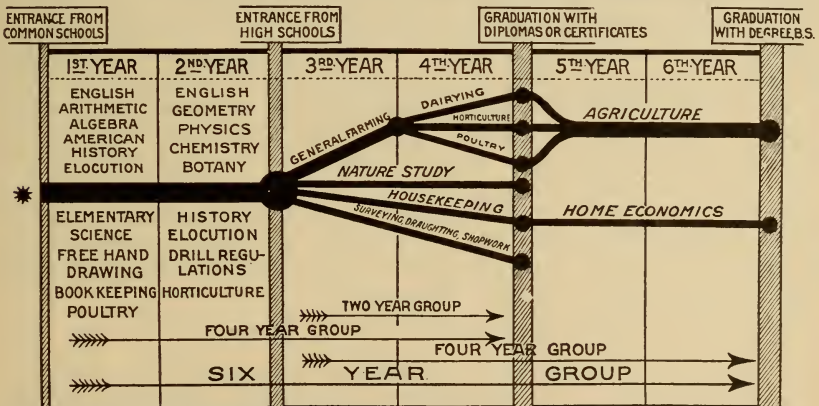
Last year, discussing certain addresses of speakers who had preceded him on the programme of this section, Director Bailey, of Cornell, took occasion to say:

"Through the papers there seems to run a sentiment that training for mere manual skill should be eliminated from courses that lead to degrees. This you will recall is very forcibly expressed in the change of attitude in the agricultural colleges during the last twenty years in respect to compulsory manual labor. All of them have now given it up, and the labor now required in the agricultural colleges is on an educational basis, namely, laboratory work. The growing disposition to occupy the first two years of a college course with fundamental, or what some people wish to call 'pure-science,' subjects, is a further indication that mere technical training is insufficient."

In Connecticut, not overwhelmed by numbers, but responsive to the tendency and the sentiment cited by Professor Bailey, our college finally became bold enough to sacrifice this sacred tradition. Compulsory manual labor was abandoned by us five years ago. Our courses of study have undergone a radical reorganization. And it has been most interesting, instructive, and encouraging to note the results.

The following diagram will compactly exhibit our method of adjusting our institution to our local environment. Practically all our instructive labor, or agricultural laboratory work, is now included in the training of the middle two years, namely, years three and four:

Six Years of Education Provided at The Connecticut Agricultural College



* Studies of first and second years, prescribed; courses of years three to four, or three to six, inclusive, are elective, as above shown. Special Students are admitted for even one year in any course, if properly prepared. Arrows indicate groups of study, each complete in itself.

ADDITIONAL ADVANTAGES:-

WINTER SCHOOL, Short Courses, for Busy People, Profitable vacations for Farmers.
SUMMER SCHOOL, for Teachers and Others, devoted to Nature and Country Life.

FIG. 1.—Six years of education provided at the Connecticut Agricultural College.

The college still employs such students as desire to work outside class hours, and pays them for their labor. The cost of education to a poor boy continues to be moderate. Under the new rule students have not become averse to manual

labor. When the need arises our students work cheerfully, and work like Trojans. Our students are no more afraid to "dirty their hands" to-day than were the students of the old régime. Less time devoted to ordinary routine labor has made more time available for real training in technical operations, without encroachment upon time needed for study. The change has made for increased efficiency in practical farming, while at the same time making our training for farming more scientific. August 4 last, the Rural New Yorker (p. 604) gave a prominent place in its first editorial column to the following statement:

"We are sometimes asked if there is any college in the country where a person can learn *farming*—it being understood that agriculture can be studied in a number of places. This makes a distinction between the business and the science of cultivating the soil. We should say that the Connecticut Agricultural College comes nearest to being a *farming* school."

Rating the value of this judgment high or low, certainly it is true that the training of these middle two years is of such efficiency that the college never has stood better with our best, our most practical, farmers than it stands to-day.

As to the results on the side of scholarship, it will, perhaps, be enough to state the fact that graduates of high schools who have been given the education of our middle two years are received without conditions into the junior class at Cornell and elsewhere.

In brief, the abandonment of compulsory manual labor in Connecticut has made our education at once more liberal and more practical. By this means our land-grant college educational navigation is daily being made more easy, not more difficult.

These, then, are the opinions and results I would submit for your consideration, if confronted by such questions as: (1) What do we mean by student labor? (2) How did student labor ever come to be made compulsory? (3) Have our institutions lost anything by giving it up? (4) How shall our training, particularly in agriculture, be made both liberal and practical, in the view not only of our founder, but also of our clients?

CONTROL OF STUDENT ACTIVITIES.

The subject of control of student activities was discussed by E. B. Andrews, of Nebraska. He laid stress on the necessity of faculty oversight of nearly all things students undertake in any united way. This should not be narrow or nagging, but so free that student originality and initiative can have full play. Direction and suggestion are nearly always better than commands or stiff rules. The abuses of athletics, deplored by all, show that the wisdom and firmness of college officials can not be dispensed with. The finances of student organizations particularly call for faculty surveillance. This mainly not because students are intentionally dishonest, but oftenest because, not accustomed to bookkeeping or to fiscal responsibility, they are careless and become involved before they are aware. It is our duty to prevent this, not only to prevent cheating, but as well to make these treasurerships means of valuable training and education to such as hold them, and to make student accounting a model to other students and to the public.

J. L. Snyder, of Michigan, spoke as follows:

ORGANIZATION OF THE TEACHING FORCE IN LAND-GRANT COLLEGES.

It goes without saying that the head of this organization should be the president of the institution. It should be his organization, planned by him and entirely under his control. He should be the presiding officer, appoint all committees, and be an ex officio member of each committee. Special meetings should be called only on his initiative. The order of business in this organization should be so planned that matters brought before it may be transacted with dispatch. He should have authority to refer questions which will require faculty action to committees to be investigated thoroughly before they are brought to the attention of the faculty. The time of the faculty members is too precious to sit for

hours listening to men talk about subjects which they have not investigated, and about which consequently they know little. It is all right at times to thresh out subjects, but before the threshing begins the members should take time to investigate. Who has not been bored beyond the power of expression by listening to members attempting to discuss something to which they had previously given no investigation or thought? Such aimless, fragmentary discussion should not be permitted to encroach upon the time of the faculty.

The president should also have authority to settle all matters of discipline, or, if he prefers, to turn them over to deans of departments, or to call to his aid such a committee from the faculty as he may choose. Their action should be final. The faculty, as such, should not be bothered with questions of discipline. It should not be necessary, under ordinary conditions, to hold meetings more frequently than once a month, and then for only one hour.

The personnel of the faculty, council, or governing body—by whatever name designated—should depend somewhat upon the size and character of the institution. In the smaller institutions the full professors and perhaps first assistants may constitute this body; in larger schools the heads of departments, or it may perhaps include only the deans of departments. While this body should not be unwieldy or cumbersome, yet it should contain as many strong men from as many different departments as possible. It should be the means of maintaining the unity and solidarity of the institution; hence, as far as possible, all interests should be represented. Some institutions have two governing bodies which bear much the same relation to each other as the two branches of our National Congress. By this method a much larger number may be given a hand in the running of the institution. At the same time, the smaller body composed of a few of the leading men serves as a check on the larger and more popular body.

The rapid growth of the most of our State institutions in recent years has necessitated the employment of a large number of instructors. They far outnumber those of higher rank. They are young, enthusiastic, capable; yet their services are not needed in the governing body. The administration does, however, need their loyalty and their earnest support. Many of them are fresh from the student ranks, and are in much closer touch with the student body than are their superiors. Their personal friends are among the students rather than with the faculty. They must mingle with the students for much of their social life. They are deeply interested in the social functions of the students—athletics, and other student affairs. They are in position to exert a very strong influence on the student body; but, without organization, without direction, their influence is very often on the wrong side. With such questions as the faculty are unable to settle to the satisfaction of the student body, their sympathies are very likely—and very naturally so—to be with the students. The attitude of the faculty is such as to lead these instructors to feel that they are employed for certain specific work, and when they do that faithfully and well their responsibility ends. They do not feel a personal responsibility for the maintenance of discipline or for the general welfare of the institution.

The great question now in the organization of the teaching force which many of us are compelled to meet is: How can the instructors—those below the rank of assistant professor—be organized and put to work in such a way as to bring them into closer touch and into greater sympathy with the administration? How can this great body of young people, which usually constitutes more than half the teachers, be so organized as to exert a potent influence for good in college life? When we think of the number of instructors and their close connection with the student body we can readily see that there is a tremendous energy, a tremendous force, which might be utilized to great advantage, but which, under present conditions, counts for little in the welfare of the college community. I think it is not claiming too much to say that the instructors of an institution have it within their power to control many of the problems, such as hazing, class rushes, evils of athletics, etc., which now very often cause the administration considerable trouble.

The problem is: How can the administration secure their loyal support? First, not by organizing them as a separate body. They must be a part of the administrative force, not a subordinate organization with special objects and ends of its own; not, perhaps, in any definite organized plan. Where the institution is not too large and where it is possible for the president to come into touch with these young instructors and in a personal way elicit their help, great results can be accomplished. Where it is not possible for the president of the institution to have this personal contact with them, the deans or heads

of departments may do much. These instructors should be given recognition: they are entitled to it. They are not men hired simply for a specific piece of work, such as the day laborer; their responsibilities do not end with the work of the class room. They should be led to see that the future of these young people whom they instruct is in their hands; that they should take a personal interest in them outside of the class room; that they, so long as on the pay roll, are part of the administration although they may not sit in its councils.

The attitude of the administration toward the instructors should be one of sympathy and helpfulness. It is proper, of course, for the president of the institution to do his business with the instructors through the head of the department, yet this does not mean that he should not meet with them on certain occasions, talk with them about their work, and in every way possible show them that he is in entire sympathy with them and willing to give them any support possible. He should have them feel that he expects them to maintain, not only in their own lives a high standard of morality, but that they will take it upon themselves to correct in a quiet way the personal habits and the evil influences which may be found among the student body.

One institution with which I am familiar calls together several times a year the entire teaching force. Every one comes into these meetings on an equal footing; he is a part of the administrative force of the institution. In these meetings it has been the custom for one department to have charge and to explain to the other members of the teaching force the work carried on by that department. As far as possible the instructors of the department in charge are given a place on the programme. This leads them to feel that they are not ignored; it brings them before the faculty in such a way as to give them confidence and to make them feel that they are filling really a responsible place. This also gives an opportunity to bring before the entire teaching force certain problems of administration and discipline. In this way the instructors become interested and are led to array themselves on the right side of all administrative problems.

It is not sufficient to confine the work of these instructors to the departments in which they are especially interested. Responsibilities of an administrative nature may be placed upon them in these departments, but if they are given nothing outside of their own departments they are liable to become narrow and to view with jealousy and somewhat of envy other departments.

One important lesson which every instructor should learn as soon as possible after he becomes a member of the teaching force is that the institution is much larger than the department in which he is especially interested, and that his first loyalty should be to the institution, second to the department.

Therefore, the loyalty and the support of the subordinate members of the teaching force can be secured through the personal efforts of the president and senior members of the faculty. It can also be secured by the general meetings, which should not be too frequent but which should be made of such a nature as to interest the young men and the young women of the teaching force, and which should, in a special way, lead them to feel that they are occupying positions of responsibility.

EVENING SESSION, THURSDAY, NOVEMBER 15, 1906.

In the absence of Chairman Van Hise, the section was called to order by Secretary H. C. Price, who stated that President Van Hise had been compelled to return home. E. A. Bryan, of Washington, was chosen chairman for the remaining sessions of the section.

ELECTION OF OFFICERS OF THE SECTION AND MEMBERS OF THE EXECUTIVE COMMITTEE.

On motion, the chairman appointed the following committee on nominations for members of the executive committee from the college section: R. W. Stinson, C. C. Thach, and W. J. Kerr. They made the following nominations, which were confirmed by the section: H. C. White, of Georgia; J. L. Snyder, of Michigan, and W. E. Stone, of Indiana.

E. A. Bryan, of Washington, was elected chairman of the section, and H. C. Price, of Ohio, was reelected secretary.

The chairman-elect and secretary-elect were authorized to prepare a programme for the next annual meeting of the section.

Miss Isabel Bevier, of Illinois, presented the following address:

HOME ECONOMICS IN A COLLEGE COURSE.

INTRODUCTION.

It seems like carrying coals to Newcastle to have one who has had but a brief experience of six years of the work of home economics in a land-grant college to speak to those who have been a part of the work for thirty years. However, such as I have I give unto thee gladly, and, if the story seem too personal or savor too much of the vernacular of Illinois, it is because, being neither a prophet nor the daughter of a prophet, it seems best to speak of that which we do know and testify of that which we have seen.

HOME ECONOMICS IN A COLLEGE COURSE.

It is not necessary in this audience to spend time in discussing the name or content to any extent. Whether it be called domestic science, domestic economy, home economics, or, as one Englishman put it, domestic knowingness, you understand that, reduced to its simplest terms, home economics includes those courses which have to do with the activities of the home along the lines of applied art, applied science, and applied economics. This statement shows the work is not limited by sex lines—the facts of economics, science, and art are the same for men and women—the applications may or may not be the same. The home decorator may be of either sex, but must know the principles of art. In these days a knowledge of dietetics is essential for the physician, man or woman. Yet so long as the world is constituted as at present, the administrative side of the home is likely to be largely in the hands of women. It is said that 90 per cent of money expended is expended by women or for women. Therefore, the subject as a whole is of peculiar interest to women.

For our present purpose it seems better to consider the subject under two main divisions:

- (1) Factors in the development of home economics.
- (2) Its possibilities.

It seems to me much of the misconception concerning home economics has been due to the fact that comparatively few people have regarded it in its educational aspect or considered it in its relation to other subjects of the college curriculum. It has been to many a stone over which they have stumbled, but have passed on without stopping to consider. Closer study reveals the fact that home economics as it now exists in our colleges and universities is a part of a general educational movement and that several factors have contributed to its development. I name as some of these factors—

- (a) Education of women.
- (b) Technical schools.
- (c) Coeducation.
- (d) Changed industrial and social conditions.
- (e) Land-grant colleges.

EDUCATION FOR WOMEN.

Let us recall briefly some of the steps in the education of women. You realize that, inadequate as the training was which was afforded by the reading, writing, and grammar schools, it was provided for boys only. Girls might be taught, but they were not to be admitted to the schools. The Dames' schools were the only organized agency outside the home for the education of girls, and they are said to have afforded opportunities to learn needle work, dancing, and improvement in manners.

It is interesting to note the steps of progress in the education of girls as evidenced by their admission to the reading and writing schools for one hour per day, of their instruction in the summer in arithmetic, geography, and composition, by their brothers who were Yale students, and the various devices by which they were presented with the crumbs of education.

While New England led in provision for the education of its girls, some attention was given to their instruction in other parts of the country. The Moravian school at Bethlehem, Pa., is among the earliest. However, it was not until the last decade of the century that they were granted even a part of the privileges of the grammar schools. The only schools to which girls were admitted in Boston in 1784 were the writing schools, held between the forenoon and afternoon sessions of the public school. In 1789 a "great reform" was instituted by organizing a so-called "double-headed school." Instruction was given in reading and writing. The girls attended reading school in the morning and the boys the writing, and vice versa; so separate instruction was maintained. The position of girls as regards educational privileges in New England at this time is shown by the action of the school board of Gloucester, which voted in 1790 ^a "that two hours of the eight hours of daily instruction be devoted to girls, as they are a tender and interesting branch of the community, but have been much neglected in the public schools in this town." It appears that they continued to be "tender and interesting" without much opportunity for self-improvement until 1820, the time of the organization of Mrs. Willard's Female Seminary. One year later Catharine Beecher's school was established at Hartford, and the process by which girls were to be transformed from females to women was well begun.

The story of the organization of the Boston High School for Girls is given in the Report of the Commissioner of Education ^b as follows:

"On September 25, 1825, the city council appropriated \$2,000 for a high school for girls. The school was instituted January 13, 1825, and before the end of the second year had become so popular, the applicants for admission were so numerous, so many parents were disappointed that children were not received, the demand for larger and better accommodations involved such additional expenditures that the school committee, under the lead of the mayor, Josiah Quincy, met the emergency by abolishing the school and pronouncing it a failure. For a period of twenty-three years no attempt was made to revive the subject in either branch of the city council."

Meanwhile a new instrument of education had appeared, viz, academies, of which Phillips Academy at Andover and Exeter are noted examples. The institution ^c at Medford, Mass., opened in 1789. "dignified by the title of academy," is said to have been the first for girls in New England. Leicester and Westford were coeducational from the start. Bradford, founded 1803; Adams, 1823, the first incorporated expressly for girls, and Abbot Academy, 1829, are among the most noted.

The scientific inventions and discoveries and the consequent industrial development made necessary appropriate educational instruments. The content of education was enlarged to include technical training. This demand was met in part by the introduction of what were called manual-labor seminaries, examples of which are Rensselaer, New York, 1824, and the Fellenberg Institute, of Windsor, Conn. The experiment was tried in a number of States. Many of the institutions failed or continued under other names, but they had their part in enlarging the educational outlook and in dignifying labor.

The founding of Oberlin College for both sexes, 1833; the introduction of a school for engineers, Troy, N. Y., 1835; the opening of Mount Holyoke Seminary, 1837; the beginning of normal schools, Lexington, Mass., 1839; the founding of the New England Female Medical College, 1842; the founding of Vassar in 1865 are illustrations of the broadening educational outlook and the recognition of the need of definite training for special work. The engineer, the teacher, and the nurse were given opportunity for definite professional training.

TECHNICAL SCHOOLS.

The demand for practical education and industrial training is shown in the founding of technical schools. Massachusetts Institute of Technology, 1865; Lehigh University, 1866; Worcester Polytechnic School, 1868. The year 1870 seems remarkable for the number and variety of its experiments in education. It was in this year that drawing was made an integral part of the work in the Boston public schools, that Michigan and Illinois industrial universities were opened to women, while cooking and sewing were introduced into the schools of

^a Outlook, vol. 82, p. 191.

^b Report of the Commissioner of Education, 1871, p. 512.

^c History of Education in the United States, Dexter, pp. 428-429.

the Eastern States. The idea of manual training received a great impetus in the Centennial Exposition of 1876, and led in the next decade to the founding of schools for manual training in most of the large cities, the first being established in St. Louis in 1879.

By the close of the nineteenth century it was evident to the student of educational affairs that the industrial spirit in education was a mighty factor; that courses in applied science and applied art (their interpretation and application to the activities of daily life) would have a place in the school programmes, and that a knowledge of the classics was no longer the measuring unit for educational standards.

While much is to be said concerning the advantages of being first to enter a new field, there are compensations for being behind time. The fact that the education of women has lagged behind that of the men has saved much experimenting on the women. The technical schools for men practically settled both the technical and educational value of such training for women.

COEDUCATION.

It is perhaps difficult now to appreciate just how much coeducation and the technical schools have meant in the development of the education of women, particularly in work in home economics. To be sure in the early days of coeducation the women were so interested in keeping step intellectually with the men that they gave themselves sometimes too strenuously to the joy of that privilege. Again, applied science for men as taught in the technical schools gave a certain definiteness to their work in science, which was much needed in woman's work in those lines. It is not perhaps too much to say that much of woman's early work in chemistry was a more or less indefinite playing with test tubes in which one of three results was expected—a beautiful color, a bad odor, or an explosion. She was not long in discovering that her brother took chemistry and bacteriology not because some one had told him that it ought to form a part of a liberal education, but because he expected to use this knowledge later in his work with soil or in the dairy. Women were thus helped to see that there was a field of applied science for women as well as for men. They realized later that the laws of heat could be illustrated by the kitchen range quite as adequately as by the steam engine, that the life history of bacteria could be studied in many household processes, and that the chemistry of food was in many cases better suited to their needs than that of stones under the title "Determinative mineralogy." Thus there came into being the applied-science side of home economics. Applied art was a later development.

LAND-GRANT COLLEGES.

For more than thirty years some of the land-grant colleges have had work in home economics. Iowa, Kansas, and Illinois were pioneers in this movement, and from that early day to the present no one agency has been more effective than the land-grant college. In the past decade the number of such departments has greatly increased in the land-grant colleges until now they number 36. No one agency has seen the possibilities of the subject so clearly or laid for it such broad and deep foundations. These colleges are, and have ever been, schools for the people—schools for the home. It has been their particular province to determine and interpret the principles underlying the work and the life of the farm and the home. Agriculture and home economics have had much in common in their development. Both are among the newer subjects of the college curriculum, so they have had to bear the questioning that is bestowed upon any new idea, the indifference of those who feel that "the old way is the best way," and the scorn of the student of the classics for "bread and butter education." The agriculturist has had no difficulty in recognizing the need of the scientific basis in his own field, and he appreciates perfectly the necessity for it in home economics. He never makes the mistake of interpreting home economics as baking and millinery. As a result of the investigation and teaching of these colleges the old idea that anybody can farm and that anybody can "keep house" has well-nigh disappeared, and with it the idea that farming means plowing only, and that the activities of the home are fully represented by the making of hot biscuits. Changed ideals concerning essentials in education and the marvelous development of the work of the agricultural colleges have served as an incentive to better work in home economics, and both agriculture and home economics have steadily made perceptible progress toward better educational standards.

It has been well for both agriculture and home economics that their origin and their materials have kept them closely in touch with the people and so keenly alive to their needs. The spirit which animated the founding of the land-grant colleges was the spirit of the development of the individual that he might yield better service to the nation, that so the nation's interests might be advanced. So the final outcome of either line of work has always meant better homes, better citizens. One great factor in the development of both subjects has been the generous support afforded them and the consequent freedom to try experiments that required time and money that few private enterprises could command.

It is evident, then, that in the varying lines of work included in the term home economics there is room for a great variety of agencies and very diverse methods of procedure. It would also appear that there yet remains to the land-grant colleges and the State universities the task which was peculiarly theirs in the beginning, viz, the strengthening and deepening of the scientific basis in the work in home economics. It is theirs to determine the principles which underlie processes with which the world has long been familiar and to elucidate and interpret the newer phenomena in their relations. It is their privilege to dignify labor by sending forth from their halls, not farmers, merely, and cooks, but educated men and women, who, because of their knowledge and skill in the practices and principles of the arts of the home, shall be able to use them as a means of expression for their best endeavors in the service of others.

POSSIBILITIES OF HOME ECONOMICS.

The possibilities of home economics are limited by—

- (a) The resources of the institution.
- (b) The skill and tact of those who plan and conduct the work.
- (c) The attitude of those in authority in the college.

When one mentions resources the listener is apt to think of the endowment fund or the legislative appropriation only. Few realize how much of the materials of the work of other departments can be utilized by the department of home economics or how much illustrative material can be secured from manufacturers for the asking. As departments are managed in land-grant colleges that of home economics is not an expensive one to equip or maintain. House sanitation, for example, can be taught in any reputable college with practically no additional expense. The same is true of chemistry of food. Only the other day the dean of women in a small college regretted that the college was debarred from having such a department by the additional expense it entailed, and I felt that she did not appreciate how much might be done with the resources already at hand if utilized, and here may I suggest what seems to me is a frequent mistake in beginning such a department, viz, the feeling that nothing can be done until an expensive kitchen equipment is secured. It seems to me that the average girl in the land-grant college knows more about the food supply in the home than she does concerning the wise use of color and form and fabric in it and that much is to be gained by using the house, its construction and sanitation as the basis for the study of home and family life. The food supply takes its place, then, as one of the factors in the home life and work. Her love of beauty, her sense of form and color, the necessity of a knowledge of fabrics and furniture are all brought into use in the furnishing of this house. And all the while the student is helped to a better appreciation of the meaning of home and family.

With regard to skill, tact, and knowledge of those who direct the work, out of all that might be said on this subject I prefer to select only a few points which seem to me general principles. If the field includes applied art, economics, and science, the need for specialists is quite evident. No one individual could be expected to have sufficient knowledge. The work of organization leaves little time for the research needed to meet the questions that come to such departments daily. Dietetics in these days does not mean fads and foibles about food. It means the latest and best information the chemist, physiologist, and cook can give us about the composition, preparation, and digestion of food. Decoration does not mean a little daubing of color on china, but rather a knowledge of the principles of architecture, art, and design, with ability to portray color and form. Henderson says: "If one does not know where one wishes to go, there is small chance of success in devising a successful programme for getting there." So, if one is to apply science one must know pure science.

THE ATTITUDE OF THE COLLEGE AUTHORITIES.

It is said that Boston is not so much a place as an attitude of mind. It is particularly true of home economics that is attitude of mind. Some college authorities seem to act on the supposition that a thousand-dollar kitchen and a two-thousand-dollar woman will insure a satisfactory department. That is a serious mistake. Within the past month two such women have told me they felt that they were working against a stone wall because of the attitude of their collaborators. The patronizing smile and the calm indifference are alike deadening to the work. Sympathy, appreciation, and helpful criticism are needed, not "passing by on the other side." I speak thus strongly and freely because I have no grievances of my own. No one has had or can have more loyal and generous support than has been given to me in the University of Illinois. In conclusion, then, it seems to me you as men in authority in land-grant colleges can best serve the interests of home economics in your institutions by protecting and improving those courses.

W. A. Henry, of Wisconsin, presented the following address:

THE AGRICULTURAL COLLEGE AND THE STATE; A PLEA FOR A NEW DIVISION OF COLLEGE AND STATION WORKERS.

American agricultural colleges and experiment stations became a recognized force in the decade beginning 1880. In those days the investigator was expected to carry on researches, and the teacher instruction at the college. We now find the college and station force overwhelmed with duties other than those originally assigned them. We are called on to assist at agricultural conventions of all kinds and attend innumerable farmers' institutes. Our presence must be noted at the leading fairs, and the animal husbandry department must furnish live-stock judges, while those in other departments place awards on field and garden products. The professors must ally themselves with the agricultural papers and prepare answers to inquiries almost without end. It is commonly held that farmers are not letter writers. Our station workers are now overwhelmed with an ever-increasing flood of farmers' letters calling for information and help on every possible topic.

In the beginning we planned that when the investigator had made some discovery, or had worked known agricultural facts into more useful form, he would prepare a bulletin setting forth these results, and, this done, would go back to his original work once more. But the issuance of a useful bulletin is usually only the beginning. The author must further elucidate, elaborate, and explain, through the press, on the platform, and by letter, until often more of his time is taken up by what follows from a bulletin than was originally required to make it. Many of our investigators and teachers now spend more time and energy outside their supposed field of effort than in the work for which they were specially set apart.

Remember, we are not finding fault with the situation. Our agricultural colleges have been growing along the lines of least resistance and grasping the greatest present opportunities. Gradually the farmers have come to use the college and its workers, who have found that they can often do the most telling work for the time being by deserting their laboratories and study rooms and even their classes, and going out to their clients. These distractions are, after all, the very best evidence possible of our success.

As a remedy for the present unsatisfactory situation I suggest that there be organized in every college and station a separate corps of workers whose sole duty shall be to serve as intermediaries between the college and station on the one hand and our great farm clientele on the other. They will relieve the investigators and teachers of a large portion of their present extra college and station duties. High-grade research and the best quality of class-room instruction will then, and only then, be possible. With this corps of specially trained middlemen our colleges and stations will serve the farmers far better than is now possible. To my mind there is no other way to relieve the present strained conditions and at the same time help our farmer clients as we should help them in their ever-increasing demands upon us.

I would not have our high-grade workers entirely withdraw themselves from the people; that would be almost as unsatisfactory as the present system. My thought is rather that we relieve them of the thousand and one minor details

which they now carry and let them go outside their regular duties only at such times as may seem best.

What should be the character of those employed as extension workers and demonstrators? They should be men who will get in close touch with the farming class, having special ability to combine science with practice. They will take up systematically the numerous miscellaneous things now forced upon our investigators and teachers, doing this work far better than it is now done, because it will be their sole work, and their reputation hangs thereon.

A few illustrations:

In States strong in dairying the extension workers could conduct monthly butter and cheese scoring tests at the dairy school. Factory operators would send samples of their butter and cheese at stated intervals, and the findings of the judges would be reported back to the makers. Some colleges are doing just this at the present time, and as a rule there it ends. It is cut short because the college men are too busy to carry it further. When we have a special corps of extension workers one or more will go out to these factories where poor butter is made, study the cause, and point out the remedy. If unable to do so, they will take the trouble to the higher station authorities for assistance. Here we have a case of how a piece of work now usually only half done by some of our dairy schools will then be well and helpfully done.

Bovine tuberculosis is a scourge, menacing producer and consumer of dairy products. Our people should be quickly educated concerning this dread plague. A few of our colleges are doing something in this line, but in a slow, unsatisfactory way. We need demonstrators whose sole business it will be to conduct a vigorous campaign. These men will secure tuberculous cattle and exhibit them alive at gatherings of the farmers, such as the State and county fairs. The assembled crowds will first see the living diseased animals and then witness the post-mortem examination. If this work is properly and extensively done over a whole State, somewhat as here described, we can accomplish more in a year toward driving out bovine tuberculosis than we are now doing with bulletins and platform lectures in twenty years.

Another illustration: Some of our stations have issued bulletins on potato spraying. They have been doing so for years. In how many potato districts are the farmers generally actually following the instructions? Under our proposed system the demonstrators will put spraying machines into many potato districts in one season. They will hold advertised meetings in the potato fields at spraying time. The farmers will assemble to witness the work of the machines. They will see Bordeaux mixture made in quantity and applied practically. At digging time they will come back to be shown the difference in yield between sprayed and unsprayed portions of the field. Compare the effectiveness of such work with reading a bulletin, received perhaps in winter time, or listening to the college professor on the institute platform.

Instead of newspaper articles, station bulletins, and institute talks about good roads, why not detail a demonstrator to have a lot of drags made and arrange with proper parties at various points in the State to keep short sections of properly made earth roads in good repair by use of the drags? Have we not talked, written, and resolved long enough about our country roads? Should we not teach by example instead of talk?

These illustrations are given not to cover the field of opportunity, but rather to point out a few things possible to accomplish, and especially to show the vital difference between our present imperfect system of helping our farmers and future possibilities when we have properly organized extension and demonstration work.

These extension workers could conduct most of the college and station correspondence, help at institutes, aid with special railway lecture trains, arrange excursions to the college, care for visitors, keep the college and station work before the public through the press, and in ways innumerable relieve the present force, giving our constituents far more extended and efficient service than they are now receiving.

But, you say, we are doing these very things now. Yes, each college is doing some of them, and all combined are, after a fashion, doing all of them. But, my friends, are these extra college and station duties being attended to as they should be, and are we conducting research and college instruction as we should? Can one professor conduct research, teach college classes, lecture at farmers' institutes, attend State conventions, go out among the farmers and show them how to combine science with practice, write newspaper articles, and do many other things, each and all wisely and efficiently? A manufactur-

ing corporation employs workmen, inventors, designers, draftsmen, pattern makers, office force, and lastly, but not least, a corps of commercial travelers, whose sole business it is to advertise and place the manufactured articles with the customers. The commercial traveler or middleman is of the greatest usefulness in the industrial world; it is time we recognized the necessity of the same factor in our college and station work.

It is now forty years since the passage of the first Morrill Act by the General Government making provision for agricultural education. Since then three other grants have followed for agricultural instruction and research. The last gift—the Adams grant—is specially guarded that original research shall be advanced. The wording of the act shuts out demonstration and extension; we must use the money for research. All this is a roundabout way taken by those in high authority of telling the several States of the Union that it is now for them to supplement the Government gifts with liberal State allowances to our colleges for helping our farmer constituents to a knowledge of the work of the stations and training them in the higher principles and practices of agriculture. The very acceptance of the Adams Act by a State, in my judgment, lays an obligation on the State so accepting that it back up and support with liberal allowance the Government gift. I hold, then, that each institution receiving the Adams grant should, without delay, appeal to its State government for at least a duplication of the sum it will receive through that act. Fifteen thousand dollars annually is none too much to start extension and demonstration work; more will soon be required.

I estimate that such helpers as we need in this extension and demonstration will cost from \$800 to \$2,000 each, annually, for salary, while necessary expenses and equipment will equal their salaries. Fifteen thousand dollars will allow the employment of five or six men in the extension and demonstration department and support them properly.

Remember, under the proposed plan these men are not to teach, they are not to conduct research, nor are they to assist directly those who do. They are to be strictly extension workers and demonstrators. We can appeal to those in authority for this financial assistance, for these men are to devote themselves to the great and important work of bringing the college and station to the farmer. They are to constitute the one great link now lacking, which will bind us to the people we serve. Surely, in view of four great gifts by the Government, the States we serve will not refuse us this request.

A. B. Storms, of Iowa, presented the following address:

THE RELATION BETWEEN THE LAND-GRANT COLLEGES AND THE MECHANICAL INDUSTRIES.

The relation between the mechanic arts and a college of mechanic arts must, in the nature of the case, be important if the college is to fulfill its obvious functions and if the mechanic arts are to derive from the college direction and assistance. At the risk of wearisome iteration, I must quote for my text section 4 of the act of Congress establishing an endowment for the "support and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislature of the State may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." The land-grant colleges were therefore organized expressly for the benefit of the industrial classes of the United States, this being very strongly, broadly, and fully worded in this act, which forms the organic law of each of these institutions. Experience since the organization of the land-grant colleges has shown that they can aid the industrial classes to advantage in many other ways than by the giving of instruction to the students present at the institutions. One of the most important spheres of work which has developed has been the conducting of scientific researches of direct aid to the industries of the different States. The present age is one of applied science. This era will be known in history as the age of science. Satisfactory progress in all industries is increasingly dependent upon scientific research of such a nature that it can not be properly carried out by private persons or in private laboratories,

The agricultural experiment stations have been the direct answer by the Government to the pressing, modern demand for help in the way of scientific research in agricultural industries. In this way the original purpose of the land-grant college has been extended by Government action to more direct assistance of agricultural industries and with most beneficial results.

In a broad sense, the students in actual attendance at the land-grant colleges are but the nucleus of the college constituency. The entire industrial classes are more or less widely and helpfully under its influence. The bulletins giving the results of the researches conducted by the experiment stations are scattered throughout each State and make these results valuable to all the people of the States by special instruction, college extension work, articles contributed to the public press, by assistance of the faculty in conducting institutes and technical meetings. The land-grant colleges are immediately instructive to the entire public.

Very slight reflection must show that this experimentation, which has been so very beneficial to the agricultural industries, must be of still greater benefit when extended to the mechanical industries of the State. At Ames we were receiving constant demands for assistance from the various mechanical industries of Iowa. We were able to be of material benefit to them by results of the investigation work carried on at our college. An engineering experiment station was the only logical answer to the call of the mechanical industries for help in maintaining their place in the race for supremacy in the industrial world by making available every assistance which science could afford. New industries are calling for scientific aid in their development, and old industries for their improvement. In Iowa manufacturing industries are as yet in their infancy. Iowa may serve as an example of some of the lines in which a land-grant college may be called upon to assist the mechanical industries. Raw materials are shipped out of the State to far-distant factories and returned to be sold to the population at enormously increased prices. The cost of transportation in both directions is properly considered an unnecessary burden upon the public.

The engineering experiment station has recently been established by act of the State legislature, and a small annual appropriation made for its maintenance. As with most legislation of this kind this act was the result of a felt need which had been aroused, directed, and organized by the cooperation of the college engineering division and the mechanical industries of the State. In general, legislatures are not looking for an opportunity to appropriate money. If they see a new light it has to be persistently held before their eyes, rightly focused, and then their eyelids have to be pried open. And yet it may be questioned whether any appropriation or appropriations made by State legislatures yield such immediate and substantial pecuniary benefits as those made for agricultural and mechanical experimentation.

But the appropriation itself is a minor factor. No amount of money appropriated for experimentation would ever accomplish anything of value except there were men in the college faculties possessing the spirit of research and combining with this spirit a very genuine interest in the industrial benefits to be derived from the applications of science to the industries.

It is due to the possession of this spirit combined with characteristic energy and resourcefulness on the part of Professors Marston and Bissell, dean and vice-dean of our division of engineering in Iowa State College, and other collaborators; Associate Professor Mecker, in mechanical engineering; Prof. S. W. Beyer, in mining engineering and geology; Prof. L. B. Spinney, in electrical engineering and physics; Associate Professor Ashbaugh, in civil engineering, and their able and enthusiastic assistants in their various departments, and to the investigations and experimentation which these men inaugurated and carried on before any provision was made by the State for the support of this work, that an engineering experiment station became a logical and practically necessary outcome.

Several years ago Professor Marston made this statement in his report:

"The several engineering departments have undertaken during the past ten years and will continue in the future to undertake to carry on investigations of interest and value to the industries of Iowa, as need therefor may arise, in so far as the funds available will permit."

"Up to the present time," he says, "much has been done along the lines of sewage disposal and other phases of sanitary engineering, of clay working and coal mining, of electric lighting and telephone work, of gypsum and other mineral deposits, and of power generation and transmission.

"While Iowa is primarily an agricultural State, the needs of modern life prompt to the development to the full of all natural resources, and the division of engineering wishes to aid in every way in this development.

"Owing to the lack of funds, the aid thus freely offered is limited. It is hoped that this limitation can be removed in the not distant future and that the college will have as a feature of its work an engineering experiment station."

The annual appropriation has now been secured, which, though of very small amount, gives recognition to an established engineering experiment station. Already bulletins have been issued upon the following subjects:

Tests of Dry-Pressed Brick.

Steam Generation with Iowa Coal.

Dredging by the Hydraulic Method.

Iowa Sewage-Disposal Systems.

Good Roads Problems in Iowa.

The Assessment of Drainage Districts.

Tests of Cement.

Tests of Incandescent Lamps.

Railway Taxation.

The investigations which have resulted in these bulletins have been conducted by men trained to scientific accuracy, and their conclusions have authority. It is understood that the men conducting these experiments and giving forth their results are and can be influenced by no other consideration than the desire for the truth and, as servants of the public, to give forth accurate and truthful results. The college therefore enjoys a degree of public confidence which a private laboratory or merely professional service could with difficulty secure. The reputation of the men responsible for these investigations and the character of the institution are at stake, and these constitute the highest safeguards against carelessness or the influence of unworthy motives.

As an illustration of the nature of the work undertaken and the results secured, the latest bulletin to be issued may be cited in evidence, viz. Tests of Incandescent Lamps, prepared by Prof. L. B. Spinney. An extended series of tests were conducted to determine first the initial candle and wattage test, life test, candlepower-hour test, and vacuum test. The tables giving the results of these tests upon various makes of incandescent lamps are published. It is obviously very difficult, and for the most part impossible, for private firms and corporations furnishing electric light or private consumers to conduct such tests for themselves. Yet the importance of accurate and definite information is obvious. The conclusions of this particular series of tests are evidence of the importance of the subject. These conclusions, in brief, are as follows:

(1) There is a wide variation in the incandescent lamps to be found upon the market—(a) in selection, (b) in actual candlepower, (c) in actual wattage, (d) in vacuum (and therefore in life, since, other things being equal, a low vacuum indicates a short life), (e) in "spherical reduction factor," i. e., the ratio of the mean spherical to the mean horizontal candlepower.

(2) About 62 per cent of commercial 16-candlepower lamps are well selected.

(3) About 76 per cent of commercial incandescent lamps are properly exhausted.

At my request Professor Bissell submits the following outline of work done in the department of mechanical engineering experimentation, recently completed or now in progress:

"Our principal efforts of late years have been confined to throwing light upon the subject of the generation of power from Iowa coals, or coals which are available in Iowa. To this end we have investigated by experiment the behavior of various Iowa coals when hand fired and when fired by mechanical-stokers. I think we have demonstrated that it is possible to get good results with mechanical stokers using Iowa coals, but we are not yet prepared to say whether or not there is a saving in the use of the stoker. There is no question, however, but that the use of the stoker reduces materially the amount of smoke generated by the combustion of Iowa soft coals.

"We have investigated the subject of producer gas for power to the extent of making an extensive test on a 150-horsepower plant at Algona, in this State, in which producer gas was made from ordinary hard coal and delivered to a gas engine designed for utilizing it. The results are valuable as showing the capability of the gas engine when used in this way in competition with the steam engine using soft coal. The exact saving would depend upon the prices of the coal in question for a particular case.

"A large amount of work has been done with regard to the values of different fuels by the United States Geological Survey, and some of the more important results obtained by them as applying to Iowa fuels have been presented in bulletin form under the title 'Notes on Power Generation in Iowa,' in which are incorporated also the data recently collected by us pertaining to mechanical stokers and producer gas engines.

"We propose during the present college year to make a direct comparison on the 250-horsepower water-tube boiler, hand fired, and a precisely similar boiler equipped with a mechanical stoker. The conditions are more favorable for an exact comparison than any which we have as yet been able to create.

"Other lines of investigation to which some attention has been given and the results of which have been published are as follows: Efficiency of steam-pipe covering, the results of which are given in Bulletin, vol. 3, No. 5, being compiled from thesis data by Prof. W. M. Wilson. The general conclusions from the information presented in this bulletin are that it pays to apply pipe covering. Up to a certain point the saving, taking into account the fixed charges, is proportional to the efficiency of the covering, but when it becomes necessary to double the thickness of the covering it is questionable whether at ordinary steam pressure the saving in fuel is equal to the additional annual fixed charges.

"Other lines of investigation are shop methods employed in the manufacturing establishments of Iowa; the properties of liquid fuel; the deposits of peat in Iowa; and the prospects of developing the same into a useful fire asset, and the relative values of the different designs of hot-water radiators."

And from Professor Beyer, in geology and mining engineering, the following outline:

"Regarding the relation of the department of mining engineering and geology to the industrial interests of the State permit me to say that the department is called upon:

"(1) To aid in the discovery of new natural resources and to assist in the establishment of new industries to utilize them.

"(2) To assist established industries to enlarge and better the quality of their output.

"(3) To assist in extending the usefulness of natural products already known.

"(4) To analyze and identify minerals, ores, and rocks sent in by citizens of the State and pass upon their economic value and commercial possibilities.

"(5) To identify fossils and other natural curios.

"(6) To furnish young men who are prepared to assume positions of responsibility in the mines and ceramic industries.

"During the past two years the energies of the department have been devoted in considerable part to the discovery and investigation of materials suitable for the manufacture of Portland cement; to an investigation of our domestic limes and foreign competing limes and materials suitable for lime making; to an investigation of clays and shales to determine their suitability for the various kinds of clay wares. The department has under way at the present time a series of experiments to throw light upon calcining temperature and keeping quality of the gypsum plasters.

"Under 4 and 5 I am of the opinion that the department is called upon to determine more than one hundred samples per year.

"Last and by no means least, there is a growing demand in the State for technically trained young men."

In addition to what Professor Beyer has said, I might add that the demands for tests of gypsum, limestone, and clays are so urgent and such keen interest exists concerning these resources that the department is embarrassed. Large investments of capital are at this moment waiting only the word of encouragement from this department concerning the quality of the raw material. In the nature of the case these investigations must be most carefully conducted and the samples of material faithfully selected. But the results may also be definite and quite conclusive if conducted by men who are familiar not only with the laboratory and with the scientific analysis, but also with the modifying conditions such as locality, water and fuel supplies, and transportation facilities.

In still another line of investigation the transportation interests of the State are being studied. The college has been making investigations and has had a series of lectures on railway questions by experts, these lectures being reproduced for the benefit of the general public:

Public highways of the State are under the direct care of the college, which is, by law, the State highway commission. Very extensive work has been inaugurated in this line. The road officers call upon the proper college department for plans and specifications for their work and have assistance in many

ways. The college conducts a good-roads school for the benefit of these officers and disseminates extensive information on good roads subjects. It has, with the aid of the State census officers, conducted the first road census ever undertaken in any State.

In civil engineering, the department over which Dean Marston formerly presided, as most of you know, very valuable original investigations have been made with reference to sewage disposal, a part of the results of which are gathered in the bulletin on Sewage Disposal in Iowa. For years these investigations in sewage disposal have been systematically carried on. Each year a representative of the engineering experiment station visits each of the disposal plants in the State, making chemical and bacteriological tests of their efficiency. From time to time bulletins will be published on this subject. Perhaps in no respect is this kind of service more important than in developing a civic conscience upon sanitary questions. No sanitary plant is automatic and no system of sewage disposal can work with satisfactory results when subjected to neglect by ignorant and careless civic officials. The value of scientific instruction—the urging of municipalities to conscientious and scientific care of sewage disposal is by no means the least important result of such instruction.

Water supply is another important question. The experiment station has a laboratory which makes, at the bare cost of the work, chemical and bacteriological analyses of the water sent to it.

Building materials of the State are tested by the engineering experiment station, the results being published in bulletin form. The laboratories of the experiment station are open to the citizens and corporations of the State for the testing of different materials. Cement, paving brick, building materials, etc., are tested and reported upon promptly for the bare cost of the work.

Though most of our work is as yet in the initial stages only, the opportunities are limitless. Yet most cordial appreciation has been shown by the people of the State and intimate relations are maintained between the college and the different industrial organizations. In several instances professors of the college are elected officers of these organizations, and almost always important places on programmes of the annual meetings of the industrial associations are assigned to members of the college faculty.

In this paper I have spoken of the work in our own State without referring to the extensive and important work being carried forward by the engineering experiment station of the University of Illinois, nor have I sought to inform myself in detail as to similar work in other institutions, presuming it would better suit the purpose of this hour to give definite information concerning the work actually being carried forward in one institution. Nor have I sought to dwell upon the obvious fact that the time has come when the resources of the country must be handled in accordance with the approved methods of applied science. How bristling and inviting are the unanswered questions and the unsolved problems all about us is strikingly evidenced by such addresses and papers as those given by Professor Voorhees in the issue of "Science" for September 28, entitled "Some Problems for Agricultural Chemists," and in the address of Calvin Milton Woodard before the American Association for the Advancement of Science, December, 1904, in which he speaks of the pressing problems concerning the utilization of waste energy, concerning the establishment of artificial centers of power, the purification of rivers, and concerning the use of steel, concrete, and cement. Concerning the artificial centers of power, Professor Woodard utters the following prophecy:

"I look forward to the day when, instead of a small volcano of smoke from a brick crater above every house, St. Louis will have all its heating and cooking done by gas, and all power will be furnished by electric currents, or by gas and combustion engines, both gas and electricity coming from the gas works and power plants at the mouths of the coal mines in Illinois. What an era of cleanliness and comfort this presages! This era of cleanliness will be brought about by the engineers."

If the engineers of the schools in cooperation with the practicing professional engineers can achieve this result alone, they will have earned the everlasting gratitude of a catarrh-cursed, smoke-besmudged race of mortals, trying their best to penetrate the overhanging gloom to the blue sky, and overtaxing memory and imagination in trying to recall the bright sunshine of country boyhood homes and the pure air of the woods and the prairies, under the blunt stimulus of yellow streaks of dirty light that filter through continuous clouds of coal smoke and the bitter tang of winter winds that blacken as well as bite.

AFTERNOON SESSION, FRIDAY, NOVEMBER 16, 1906.

The section convened at the close of the general session at 12.15 and, on motion, the address by Dean C. F. Curtiss, of Iowa, on "The short practical course, its place and importance in the land-grant college," and the address of Dean Eugene Davenport, of Illinois, on "Agricultural extension in the land-grant colleges," which were still on the programme of the college section, were postponed until the next annual session of the association, and the secretary was instructed to provide for them on the programme for next year.

The section then adjourned sine die.

SECTION ON EXPERIMENT STATION WORK.

AFTERNOON SESSION, WEDNESDAY, NOVEMBER 14, 1906.

The section was called to order at 2.15 p. m., B. C. Buffum, of Wyoming, in the chair.

KIND AND CHARACTER OF WORK UNDER THE ADAMS ACT.

A. C. TRUE, of the Office of Experiment Stations. Your call upon me to open this question is rather unexpected. I came to this convention very largely to learn more concerning it myself. The Adams Act aims to be quite definite in its provisions regarding the kind of work which is allowed under that act. It must be, according to the terms of the act, original in its character, and it must be research or experiment. It must have a direct bearing on the agriculture of the United States. It must have due regard to the conditions in the several States. Among the first things which must be determined is what is original research or experiment—and that is the thing around which thus far the discussion has most frequently arisen. Now, so far as the Office of Experiment Stations is concerned, this matter came to a head rather abruptly, and we have been obliged to proceed with it. And we have tried to make a practical decision of the questions brought to us. At the same time, we recognize most clearly that it is a difficult matter to define original research in the different departments of science, and particularly difficult to do so in such a complex science as agriculture. And so we have tried to get the advice of such persons as seemed to us ought to be fairly competent to give us advice on that subject, and we have come to this association meeting in the hope that from the discussions here further light will be thrown on it. The great difficulty, as I take it, grows out of the fact that the science of agriculture is so very new and has been to such a limited extent formulated in a definite and systematic way. So that while we have a large body of literature on the subject which is fairly included in agricultural science, those publications are, for the most part, of quite a fragmentary character, and it is difficult to get together the full body of knowledge which we have acquired in any particular branch of agriculture and determine in a concrete way what has been done already and what remains to be done.

This is not a matter peculiar to agriculture, as I understand it. Since the passage of the Adams Act we have taken occasion to confer with the president of the Carnegie Institution, who, as you know, is a man having long experience as a scientist and has been dealing with scientific matters for many years in a general way. He has now come to a position where he must determine what is original scientific research in many lines. He has stated publicly, and has confirmed his public statement by private expressions, that the Carnegie Institution in considering these matters has had considerable difficulty in getting before it definite, clear propositions for research. And the difficulty in deciding

as to the exact character of these propositions as regards their originality is in proportion to the newness of the science. In the older sciences, such as astronomy and physics, the body of truth already collected has been so definitely worked out that the men working along those lines have a fairly clear conception of what is already done and also of what ought to be done, so that when they make propositions for research they make them in a clear and definite way, whereas in the newer sciences the subject-matter has not been sufficiently defined to enable the men working in those lines to bring forward definite, clear propositions for original investigations. So that if we find some difficulty in regard to agricultural subjects we need not be at all surprised. While that is true, it seems to me that the only way in which we can make definite progress in this direction is to have careful consideration given to the matter and serious thought and study put upon the classification of our knowledge and classification of the problems on which to work. If we can be sure that that will be done, there will not be very much practical difficulty in reaching a determination as to what kinds of work should be undertaken under the terms of the Adams Act.

That involves, I think, two things which grow out of the organization of agricultural work in this country. The station staffs are generally composed of men representing different sciences, and the director is the administrative officer, who represents the general interests of the station and is responsible, in a general way, for the conduct of the work. Now it seems to me that if we are to get at this matter definitely, we must have the active cooperation of both the members of the staff and the directors of the experiment stations. That means that the members of the staff, in thinking about this matter and in formulating plans for the work, should consider that their professional standing is, to a considerable extent, involved in their action in the matter. That is, I am sure we will get at this thing much more clearly and definitely, and with the least difficulty, if the gentlemen making the propositions are held responsible for them in their individual capacity. When they make a proposition for work to be done under the Adams Act they should make it with an understanding of what has already been done on that subject. Here, for example, is a proposition to make an investigation on scale insects. Now, the presumption ought to be that the proposer, as a competent entomologist, has himself given thorough consideration to what has been done on scale insects up to this time, and so is in a position to know what ought to be done and what is really a new piece of work on that subject. When that matter is passed up to the director of the station it can not be presumed that the director will himself be a man who can tell, for all the branches of agricultural science, whether the work proposed is original or not. He ought, it seems to me, to make a study of his staff, and with regard to a particular proposition, make such inquiries of his staff as to determine in a reasonable way whether the man making the proposition in the first place is competent, and whether he has given proper consideration to the subject, and whether the proposition is put forth in the best way.

I speak of these things because I think that a great deal is involved in this with reference to the progress of station work. The matter is one which reaches out, it seems to me, to the whole body of the scientific work we are doing in our experiment stations. In order to get the best results we must have station workers generally feel that there is now a magnificent opportunity offered to put agricultural science on a substantial and permanent basis. If we can all work together with that spirit I am sure that definite results of great importance will follow in a comparatively short time. Thus far in the progress

of our work in this country the necessity for making fine distinctions has not been impressed upon us very definitely. There has been an enormous pressure to spread our work out, and our progress, especially in recent years, has been largely a spreading out in all directions. We have specialized, it is true. A great many more men have been brought into the station work and the subject of agriculture has been divided into specialized branches; but, after all, the men taking up these specialized branches have been led very largely to give their attention to superficial matters, and especially to reach out toward the public for whose benefit, of course, all this work is being done. Now we are called upon to go deeper, and to give attention to those things which are fundamental and original. The mere fact that our attention is directly called to the necessity for research will without doubt be a great impetus to the real advancement of agricultural science if we work together in the right spirit to that end. And the thing that encourages me very greatly in this matter is the fact that there has been so ready and general an expression that the Adams fund should be devoted to fundamental work. The great question then to be settled is, What constitutes original research in agriculture? With this introduction, I think it best to leave the matter to further discussion.

H. P. ARMSBY, of Pennsylvania. In a gathering of this sort I assume that it is our purpose to discuss ideals, and I do not think that we need to lay any particular stress here upon the difficulties that lie in the way of carrying out those ideals. The difficulties will make themselves sufficiently manifest as we proceed, and there is no danger, I think, of our setting too high a standard or of doing too much abstract work. I do not think we should discuss the question of the use of this fund from what may be called the legal standpoint—that is, what we may do and what we must do. I don't think that sort of literalism will carry us very far. This is not so much a question of legality as of opportunity. We are offered a great opportunity by this fund. The question is, how can we best take advantage of that opportunity? Not how far can we go, or must we go, in this direction or the other direction, but how can we administer this trust in the most effective way for promoting the interests of agriculture in the United States. Now, from my own point of view—and one can, of course, speak only from his own point of view—the difficulty with our experiment-station work heretofore has been precisely that indicated by Doctor True. It has been superficial, without sufficient thought. The Adams Act offers us the chance to go deeper into fundamental research. Now, it is somewhat difficult to define research, but I think if I were called upon to do so I would say that what is understood by scientific research in the minds of scientific men generally is investigation that is directed to answering the question "Why?" That is to say, it is investigation directed to the study of underlying principles, and I do not believe that we can emphasize too strongly the need for the development of agricultural science by investigation directed toward the ascertainment of fundamental principles. A great deal of our investigation heretofore has been directed to ascertaining certain facts, and the results have been most useful; but it is a far greater service to establish the principles that correlate those facts. I believe that the idea which should guide us in formulating projects under this act is the idea of experimental work directed to answering the question "Why?"—i. e., directed toward the establishment of principles. It seems to me that with that idea before us^h we can not go very far astray. There are difficulties in the way, of course, and these are greater in some States than in others, but patience, an honest purpose, and, above all, a clear conception of the end to be attained, will overcome them. The chief object of this discussion, I take it, is to help us to reach such a conception, and my contribution to it is a definition of original

research, viz, that it is research directed to the establishment of the underlying principles of agriculture.

C. E. THORNE, of Ohio. A question which has been raised in my mind is this—and it illustrates the general problem which we are discussing: Is the mere fact of acidity unfavorable to the growth of the clover bacterium, or is the acidity merely a sign that something necessary to the growth of this bacterium has been removed from the soil or transformed into a condition unavailable to the bacterium? Does it simply move the horizon one step further back? And we are confronted with some such question as that in every step of our work. Now, to me, as a student of the problems of soil fertilization, this question of acidity or non-acidity is one of very great interest. We have a great deal of literature on the question of lime in the soil. Many experiments have been made and reported respecting the effect of additions of lime to the soil, and a great many observations have been recorded respecting the superior fertility of soils derived from limestone to those which come from the decomposition of rocks deficient in lime. We know from analysis that lime is necessary to the growth of all vegetable and animal life; but we find soils which are producing abundant crops of the cereals and yet are failing to produce crops of some of the Leguminosæ. We find also that these Leguminosæ draw heavily on the lime supply. Is their diminished growth merely an indication of lime hunger, or is it something else? How much do we know respecting the growth of the bacteria of the Leguminosæ in the soil? Are we ready to say that any definite portion of lime is sufficient to the growth of these organisms? These are some of the questions that are coming up constantly in our work. How are we to answer them?

We have made many field experiments which have been entirely too superficial. We have dipped in here and there, but where have we gone deep enough to accumulate a body of facts upon which we may safely lean? Much of our knowledge of the effect of the various constituents of plants and the functions of soils has been derived from experiments made on a very small scale. Experiments have been undertaken which have been carried on for a year or two and then dropped. The whole world over there have been made very few long-time experiments—experiments which have been carried over a sufficient length of time to cover the climatic variations that follow the cyclic changes of the seasons; and, after all that has been done, where is the ground for the assumption that any knowledge, gained from laboratory experiments only, will ever serve as a sufficient guide to the results which may be expected in the field? On the other hand, where the field experiment has been made unchecked by the laboratory, where is the evidence that essential factors have not been overlooked which might have been detected under the conditions of absolute control which are possible only in the laboratory? Taking this subject alone, it seems to me that there is an illimitable field before us, beginning where the desultory field experiment leaves off, a field in which we can expect the greatest results after we have combined systematic and continuous work in the field with work of the same character in the laboratory.

This seems to me to be one of the lines of work open before us. It seems to me also that we have unlimited fields of investigation in the nutrition of animals and similar problems. The crudest foundations only are laid; but by utilizing to the best advantage those foundations we have the greatest opportunity in the history of the world to go forward in the establishment of a scientific basis for the study of questions relating to animal life.

L. G. CARPENTER, of Colorado. It has not been so much a problem to find what is possible for us to do under the law as to find what we had better take up. There is not much difficulty in finding researches that will require the funds

available and the entire energies of the station staff. It becomes, to a great extent, an adjustment of the ideal with the practical, a combination of conditions for research with impatience for results.

Now, one of the things I hope to hear is a definition of the scope and limitations within the meaning of the act, or the interpretation of the Department. In the Adams Act the funds are available for research only. The Hatch Act includes verification of experiments, and thus permits almost everything. Now, what is the interpretation of the Department of research? For, as I take it, the Department will act at least as an adviser, if not in a more directive capacity. Are what we term investigations to be considered as research? What class of experiments are to be so construed? Where is the line to be drawn, and when will investigations or experiments be deemed worthy of being termed research, within the meaning of the act?

Also, it is generally realized that the stations have a constituency—perhaps members of their own staff—without a proper conception of research, clamorous for immediate results, or for the applause attending flashy results, without realizing that results of permanent importance must be rooted deep in continuous, intelligent, and persistent work.

The act seems to be clear. The question is in its interpretation. The station managers will be subject to criticism from without, and possibly from within. Hence, to what extent is the Department firm in its convictions as expressed in its letter of instruction? Can we still count upon the Department holding up our hands in attempting to carry through such lines?

The Adams bill affords a great opportunity to the stations. Great results are to come. It will develop conditions better adapted for scientific research. Formerly the scientific work has been secondary. Under the conditions of this act, it will be possible for this work to be primary and other work secondary, and thus the scientist may realize his desire to develop research on which alone rests the foundation of applied science. It is a matter of good judgment to initiate such researches as will lead to applications in agricultural products. It is undoubtedly a mistake to select investigations in pure science whose applications are remote, though it is true that the most important researches find their application long in the future. The tendency is to search for researches having some beneficial application. Thus, even in the Carnegie Institution, whose endowment is such that it would seem that the management would be as little subject to pressure for results as any could be, the president has said that it is a constant question of electing such line of research as would find immediate application. He is therefore confronted with the same problems as are the stations.

It is true that most important researches find their application long in the future. Many of the researches have been carried out for years before the applications appear. This is true of agriculture as well as scientific research in general. It is a constant fact in the history of science that the origin of a simple application will be found far back in some remote investigation. It is not necessarily a case where a research should be excluded because its applications are remote, but naturally we will be permitted to carry on long-term investigations if confidence is placed in our judgment and our competency. Some, if not most, of the investigations should have application within the near future. It is a matter of difficulty to determine what should be taken within the scope of the act and what is the interpretation of the Department.

Undoubtedly interpretation must come from time to time, and I suppose the final result will come from the decisions that come from concrete cases.

E. W. ALLEN, of the Office of Experiment Stations. I do not want to be understood as lacking in appreciation of the practical phase of this question, but I believe that we have looked so long at the practical phase that our vision is

somewhat dimmed. I believe the experiment stations are for agriculture—for the science of agriculture, as well as for the practice of agriculture. We conduct investigations in a scientific manner, on the fundamental basis of agricultural science, in order that the practice of agriculture may be made more sure and more intelligible. The Adams fund affords an opportunity that we have never had before to add rapidly to our knowledge of these fundamentals. Agricultural experiment stations have been to a very large extent the stock in trade of agricultural teaching. Agricultural education has developed and progressed with the development of the experiment stations and their teachings. It can go only about so fast—only about as fast as the experiment stations can furnish the basis. The agricultural college, then, furnishes one strong reason and claim for agricultural investigation, which it looks to the experiment stations to supply. The stations have a duty to the college as well as to the farmer. In the selection of problems for research in the several States consideration must be given to the needs of our constituency, for this research is ultimately to benefit their practice. In some States I recognize that the pressure is already so great upon the experiment station that 'attention will have to be given to selecting problems which will have an immediate bearing upon practice. In other States problems may be taken up that will not be of much interest to farmers for some years to come, but along with these investigations come some which will have a more apparent and immediate bearing. Now, it seems to me that one of the results of this work will inevitably be something of a differentiation in our station staffs as between teaching and experimentation or investigation and between the other forms of teaching, such as farmers' institute work and demonstration work in general. Some men are by nature better suited by their mental equipment to take up the long-time investigations that go deeper into the underlying principles than other men. Other men have not the heart for investigation of that sort. We have unfortunately all too small a number of men suited to this higher investigation, but a considerable number of these have made national reputations as scientific experts in their particular branches. When we have such a man, we should do all we can to encourage him, and everything should be done to give that man the opportunity to do work that will benefit the stations as a whole. If every station will undertake some real research work, and make conditions favorable for it, agricultural investigation will develop rapidly, and our scientific basis for teaching and for practice will be greatly broadened.

Some one has spoken of experiments in animal husbandry. This has been an exceedingly practical line of work that has done a great good, because it furnishes tangible results, which can be seen and appreciated by the farmers, but there is a deeper phase of this work relating to the principles of animal nutrition. I believe the time has come for more work on these principles, for we have progressed very slowly in our understanding of the nutrition of farm animals. Such investigation requires men specially suited to it, and often special costly apparatus. Very few stations can afford to put the money into the construction and operation of a respiration apparatus, and perhaps fewer still have a man to take charge of the work. But we have one station which happily is equipped with both the man and the apparatus, and it is of interest to us all as station workers that this advantage shall be fully utilized. It seems to me we may well encourage and commend this undertaking and set our seal of approval on it as genuine research in agriculture. The State of Pennsylvania may take the attitude of many other States and say that these matters have been under investigation for a number of years and it is time to give the case to the jury. But if the Pennsylvania board can be made to feel that this

work is beneficial to the station work as a whole, and that the station investigators are especially desirous that it be developed to the fullest extent practicable, it may make the road easier for Director Armsby. It is an undertaking we are proud of, and we recognize how great its value may be to agricultural science and to the practice of feeding. It has occurred to me that it might be quite proper for this section to express its approval of this research which is being carried on at the Pennsylvania station and express the hope that it may be continued and developed under this new fund.

E. A. BURNETT, of Nebraska. At this point I would like to raise the question if it would not be proper for this association, before it adjourns, to memorialize Congress asking them that they devote specific appropriations for various years to this work of animal nutrition being carried on by Doctor Armsby in Pennsylvania. None of the men out in our western country feel that they can do that work. We feel that we have a larger problem in practical lines of work that is proving of a great deal of benefit to our people. We feel that this work is of high service, and we can not go very deeply into the problem of animal nutrition, but there ought to be some one in this country to continue these experiments as long as it may be necessary, be it for five, ten, or twenty years, or twice that long. We feel that some institution should have an opportunity to do that and should have an office provided with all the apparatus necessary to do it, and I think this association should not adjourn without memorializing Congress asking for some appropriation, which should be liberal in its amount, to aid in some such line of investigation.

On motion of H. J. Wheeler, of Rhode Island, a committee consisting of E. W. Allen, W. H. Jordan, and H. J. Waters was appointed to draft resolutions on the line of the remarks made by Doctor Allen. This committee later reported resolutions commending the work of Doctor Armsby with the respiration calorimeter, and expressing the hope that it would be continued and developed to the fullest extent practicable.

W. H. JORDAN, of New York. Mr. Chairman, perhaps we have discussed this matter as long as we care to. Permit me, however, to express my sympathy with the officials of the Office of Experiment Stations. They are in a difficult and delicate position, but we have a great deal of satisfaction in knowing that we can trust them. They are as intensely interested in the proper administration of the Adams fund as any of us can be, and they have at heart the highest interests of all concerned.

I take it that in their interpretation of what constitutes research they will not differentiate between the various lines of inquiry, nor will what is regarded as research be confined to laboratory subjects or laboratory methods. If it is real inquiry that a station seeks to enter upon, it may be carried on in the field or in the stable, in the domain of physical facts or with reference to economic relations.

I do not see why there should be any question as to what is inquiry—that is, research. It is difficult to understand, also, why it is hard to find lines of work that are important to which research methods should be applied. We all know that in the past station directors have been somewhat cautious about expending money on scientific problems that did not have an apparent application to immediate needs, but the attitude of the public has changed and we will find sufficient support, I think, for a policy of another kind.

Our station staffs should be organized with reference to new conditions. It is not wise, I am sure, to combine several functions in the same man. Some one has just stated in this discussion that he wants a bacteriologist who is able to meet the dairy husbandman on his own ground: in other words, he wants an

expert in a special department of science who is at the same time an expert in the art of dairy manufacturing. From my experience of twenty years as a station director I am confident that the function of inquiring into a special subject requiring severe laboratory methods, and therefore an extended study of literature, can not well be combined with the duties of a practical dairyman. We need two sets of men—those who seek for fundamentals and those who are busy with the exploitation of knowledge.

A. C. TRUE, of the Office of Experiment Stations. One of the difficulties encountered by the Office of Experiment Stations is that the projects proposed under the Adams Act are frequently not stated with sufficient fullness and clearness to make plain what is meant, and it may be, therefore, that in some cases wrong decisions have been reached in reference to them. I speak of this because I want to encourage in every possible way the fullest, frankest confidence by correspondence and otherwise, in order that we may get a proper insight into the proposition made along these lines.

That is one of the reasons that we have taken the course that we have. It seems to me that it will do away with a large amount of friction and trouble if we can know in advance by correspondence or conference what a station really intends to work upon. Frequently the experiment will involve some years' work. So that if we can by conference reach a decision as to what is the best thing to be done, it would save much in the actual expenditure of money and would prevent a great deal of trouble and friction. I want to make that clear to you and encourage so far as I can a full statement regarding this matter.

Now, another thing: Some persons have raised the question as to whether we would hold these matters as confidential. I have already had inquiries from certain stations as to what other stations were going to do under the Adams Act. I have refused to give out such information, and it is my intention to maintain that policy. I do not consider that the record of this work should be open in our Office, and it is my intention to hold to this policy strictly, so that I think you will be safe in dealing with us frankly in the matter.

At the same time it is not our desire to know in detail what you are going to do or what methods you are going to pursue in working out the problems. What we want to find out is the nature of the work which you have undertaken—what it actually is that you want to do. When we know that and reach an understanding, it seems to me that is as far as we ought to go.

Another thing: We don't want any responsibility put upon us to choose between the projects. For example, a certain experiment station proposes twelve different projects. Suppose we decide every one of these is good, so far as the character of the work is concerned, and proper to come under the Adams Act. But there seems to be in the mind of the director the suggestion that we might undertake to say which of those problems should be taken up. We do not want to make decisions along that line. Our object is to determine the character of the work. If we are satisfied that it is the proper kind of work to come in under this act, then it is the province of the experiment station director to decide what projects to take up. As a matter of advice, I will say that we are advising people generally to take up a few projects and put enough money into them to get something out of them.

I have spoken thus far of the difficulties in this matter. It seems to me that there are other things which can be said. One of them is that we have settled a very great and important question that has been troubling us for a good many years—the question as to how we were to get funds for original research. We have now obtained these funds as a permanent appropriation. The stations and the agricultural colleges with which they are connected are

in a better position than they have ever been before to take up measures which will more thoroughly secure the support of the great body of our constituency. These matters relate to the education of the people along agricultural lines and the giving them practical information which they desire, through bulletins, farmers' institutes, and elementary courses of instruction in agriculture in the public schools. Under existing conditions, with a larger number of men engaged in the work, we can undertake work which will tend to popularize this enterprise much more widely. While the Office of Experiment Stations is dealing with the Adams fund, it is not its purpose to abandon the effort to popularize the work of the colleges and stations. And we hope that we will be in a better position, with the help of the institutions represented here, to do that work than ever before, and that, if all of us pull together, we will be able to make the work of the colleges and experiment stations more fully appreciated by the masses of the people.

So that, looking over the field in a broad way, it seems to me that the cause of agricultural science and education in this country was never on a better footing than it is to-day.

RESOLUTION REGARDING ADMINISTRATION OF THE ADAMS ACT.

On motion of J. L. Snyder, of Michigan, the following resolution was adopted:

Resolved, That the section on station work expresses its approval of the methods adopted by the Office of Experiment Stations for the administration of the Adams Act.

It was then moved and carried that a copy of the resolution be transmitted to the Secretary of Agriculture, at Washington, D. C.

METHODS OF EXPERIMENTATION IN FEEDING FOR MEAT PRODUCTION.

H. W. Mumford, of Illinois, read the following paper:

It is consistent to consider this subject from the broad point of view of "applying logical principles to the discovery, confirmation, and elucidation of truth" concerning experimentation in feeding for meat production. For convenience, the subject is discussed under the following heads:

- I. The investigator and his point of view.
- II. The nature of the investigation.
- III. Plan.
- IV. Execution.
- V. Interpretation.
- VI. Presentation.

I. THE INVESTIGATOR AND HIS POINT OF VIEW.

Every experiment station worker is to-day more or less handicapped or embarrassed by conclusions which have been reached either from insufficient evidence or misinterpretation of data. It is extremely difficult for the investigator to be unbiased in his judgment. It is not desirable that the investigator should be without opinions and theories, but it is highly desirable that he should cultivate an inquiring mind that is always seeking new truths. Generally speaking, those of least experience speak with greatest positiveness. The investigator must early learn to distinguish between opinion and truth, between theory and fact. If the investigator is opinionated and prejudiced, he is not likely to conduct an investigation fairly, even if he intends to, especially if it has to do with some pet theory. Should the results of the test prove the fallacy of his theory, the experiment is too frequently discarded as of little value or is not presented fairly to the public. It is not necessary to urge here that the investigator should accept with the greatest alacrity the facts which are determined by careful experimentation, no matter whether or not they are in line with his former beliefs.

Experiments in meat production should be undertaken only after the investigator has, by study and observation, secured a broad conception of the business, as it affects a very large number of people. Otherwise investigations are undertaken which are too narrow in scope to warrant the expenditure of public funds. It is safe to say that an experiment should never be conducted in order to prove or disprove some individual's opinion or satisfy curiosity. There are times when the investigator's hands are tied, so to speak, because he has, from lack of funds, been forced to so plan his investigations that the actual money loss is small. More unfortunate still is the condition of the investigator who feels that the degree of success of his experiment depends upon the percentage of profit he is able to show from the feeding experience, provided an experiment in feeding for meat production is involved.

II. THE NATURE OF THE INVESTIGATION.

Investigations concerning meat production might well be classified as follows:

(a) Collection, arrangement, or classification and dissemination of information in the possession of a few that is of interest and of economic importance to many—information which may be used by the few to the disadvantage of the majority.

(b) Confirmation of accepted truths and experimental data already secured.

(c) Discovery of principles underlying facts.

(d) Discovery of new truths or facts.

Before considering these separately there are some general considerations concerning the nature of investigations that should be noted. Questions having economic bearing should neither be shunned nor allowed to unduly influence the investigator. That is to say, an experiment should not be branded as unscientific because it teaches an important economic truth. On the other hand, investigators having what might be called a practical turn of mind should not condemn experiments the economic importance of which seems slight. The writer believes that the highest type of investigation in meat production is that which discovers, by the most careful and scientific experimental methods, principles underlying new facts of great economic importance, principles and facts of such a nature and so presented as to be easily understood and applied by intelligent readers.

It is highly desirable that the results may serve as large a number of people as possible. With the present organization of State and United States experiment stations there is afforded the best possible opportunity for the United States Department of Agriculture to deal with problems of general interest and wide application, and the State stations questions which are more local in character. This does not mean that the State stations should confine their work to local questions, nor that the United States should not, where necessary, supplement State work in dealing with local problems. Indeed, instances are not wanting where the United States Government has solved local agricultural questions of great importance that have been practically untouched by local authorities. Theoretically, however, experiment station workers belonging to State station staffs should be not only best able to investigate local problems, but also to interest their constituency in the results of such investigation.

A common mistake among investigators is undertaking questions the investigation of which requires an expenditure of funds entirely out of proportion with the income of the station.

To return to a consideration of the various groups of investigations relating to meat production—

(a) *Collection, arrangement or classification, and dissemination of information.*—There are a large number of investigations which might properly be classified under this heading. As an example of this class we would call attention to Bulletin No. 78 of the Illinois Experiment Station on the Market Classes and Grades of Cattle. This bulletin has been looked upon as a valuable contribution to the literature relating to beef production. It brings out no new truths, but presents information which, before its publication, was in possession of relatively few, and yet this information was of vast economic importance to every cattle feeder and breeder throughout the country at large. We look upon this class of investigations as preparatory. It seems a logical method of preparing the mind of the investigator for a broad view of the situation. Such investigation should as far as possible be looked upon as preliminary to subsequent investigations. Without such preliminary work the investi-

gator is likely to be ignorant of certain fundamentals that will influence results and that are necessary for their proper interpretation.

(b) *Confirmation of accepted truths and experimental data already secured.*—Quite a large number of experiments in animal nutrition have proved the correctness of the opinions and beliefs of experienced live-stock producers. Many experiments are a repetition of similar experiments either in the same or other stations. Such experiments are no less valuable on that account. We shall have more to say of this class of experiments elsewhere.

(c) *Discovery of principles underlying facts.*—The aim of the investigator should be to determine underlying principles, or why certain facts exist, rather than simply that they are facts. Facts without a full understanding of the underlying principles governing them are not capable of the widest application.

III. PLAN.

The plan of an investigation should eliminate as far as possible the necessity of repetition. In many instances the writer believes that this is entirely feasible. Experiments are recorded where an attempt has been made to ascertain certain facts by repeated tests. Investigators realize that if the repetition of the experiment is to amount to much it must be conducted under entirely comparable conditions. The instances are rare where this is possible. No two seasons are alike nor the same season in different years, and in most investigations in meat production there is little, if any, control of climatic conditions. With repetition this element of error must therefore be reckoned with. Variation in the quality or grade of feeds used in feeding the animals is also a factor which figures conspicuously in such attempts. If suitable animals in sufficient numbers are used and a carefully worked out plan is executed without accident, on the principle that duplication is desirable and more nearly possible if attempted in one test, the results of such an investigation should be more conclusive than those involving a number of repeated tests under necessarily varying conditions. A correct conclusion can not be reached by averaging two or more incorrect groups of data. This subject furnishes a most excellent field for discussion.

In planning the experiment the investigator should be clear as to whether or not the investigation in hand, when finished, is complete in itself or a part of an understood series.

There are three factors which require most careful attention in the planning of an experiment in meat production. First, the animals used; second, the feeds; third, the environment. As to the animals: All the animals used should, as far as possible (a) have the same treatment previous to the test; (b) they should belong to the same grade—that is, be similarly bred and in like condition; (c) they should be of the same age, unless, of course, the experiment involves an investigation of the feeding qualities of various ages of animals; (d) they should be comparable in thrift and weight, and (e) they should be representative or normal.

Recent experiments that have been investigating the effect of certain chemical elements and compounds in the feeding of animals are to be encouraged. Pending the results of such investigations, which are only possible to a few stations, it is desirable that the stations determine first the behavior of nature's feeds—that is, such feeds as corn, oats, wheat, barley, and hay of various kinds—rather than tests with by-products of mills and packing houses, the composition of which feeds is subject to great change and the discontinuance of the manufacture of which in some instances is not unlikely.

The writer looks upon it as one of the serious problems for the future investigator in animal nutrition that producers of meat will undoubtedly be obliged to use more and more extensively such manufactured feeds. Such practice will introduce so much of uncertainty and such a wide range of problems that the practical man will be more and more dependent upon the investigator, who in turn will be greatly handicapped by being obliged to deal with manufactured products. The time has come when meat producers and investigators should insist on standardized commercial feeds.

It has already been said that animals used in a feeding test should have received the same treatment. It is equally important that they should be surrounded by the same conditions during the test. It is no exaggeration to say that this matter has not received sufficiently careful attention by investigators in the past.

The plan of an experiment in meat production should involve having suitable photographs taken of the animals used, at least at the beginning and end of the test. In some cases such photographs should be taken at regular intervals during the progress of the experiment.

IV. EXECUTION.

The very closest scrutiny by the investigator of the animals and their environment and the feeds used in an experiment should be made throughout the entire test. Many experiments have failed, not because of a lack of a careful plan, but because of lax execution. It is far easier for the man who is actually doing the feeding of experimental live stock to slight the weighing of feed or animals, or if a certain lot of animals is not thriving as he thinks they should to give them a bit of bran or an appetizer of some sort, than to follow a definite plan. It is needless to say that the results of experimental feeding to mean anything must be secured by the most careful and painstaking attention to every detail. Securing normal initial, periodical, and final weights is a perplexing and extremely important detail of a feeding experiment. The custom has been quite universal to weigh on three consecutive days (the experiment beginning on the middle day) and averaging these to secure an approximately correct initial weight. Where a considerable number of animals are involved it has been argued by some that one weight is as accurate as more. This may be true if weather and other conditions surrounding the weighing are such as to insure a normal weight. If not, then the conditions which render the weight of one animal abnormal will, in all probability, render the weights of all the animals abnormal. Frequent periodical weighings are unsatisfactory because of the impracticability of taking the average of three weights on consecutive days or depending upon the probable incorrectness of a single weight.

V. INTERPRETATION.

An economic interpretation of experimental data, where possible, is extremely valuable. It is very generally demanded by the reading public and frequently aids in establishing fundamental principles of live-stock economics. Such treatment of the data of a feeding experiment naturally appeals to practical producers as of vital importance.

In the writer's judgment the financial statement should be but one of several methods of treatment, all of which may well be worked up from the same data. Because this feature of bulletin work is likely to be more closely studied by practical live-stock producers than any other, it should be prepared with the utmost care, that no misleading impressions be given.

A detailed statement of the actual financial transactions from beginning to end is always useful and teaches lessons which any live-stock feeding experience might, but it is very seldom that such data can be relied upon to establish fundamental or important principles. Care should be taken that the financial statement does not exclude a broader consideration and presentation of the data.

Markets for live stock suitable for fattening and slaughtering purposes and feeds used in their preparation for market, leading factors with which the live-stock experimenter has to deal, are exceedingly variable. These factors must be reckoned with in dealing with the economic phases of live-stock production. The danger in dealing at all with financial aspects of experimental data is that the investigator is too much inclined to deal with current conditions only. Not only so, but there is further danger that he stops with such consideration, utterly failing to discover and present underlying principles upon which certain financial results depend.

VI. PRESENTATION.

It has been the experience of the writer that to properly interpret and prepare data secured in an experiment in feeding for meat production for presentation requires far more time than the planning and execution of the investigation.

The object of an investigation should be narrowed sufficiently to avoid jeopardizing the results by multiplying the objects. Data secured relating to a single question may frequently be made to apply to a number of problems, if sufficient consideration is given it. There are two classes of results, (a) con-

clusive and (b) indicative. The investigator should early learn to distinguish quickly and clearly between the one class of results and the other and present the data in such a way as not to be misleading. Plates illustrating animals and equipment used in an experiment, together with illustrations showing the conditions and quality of animals used at the end of the test, should constitute a prominent and extremely valuable feature in presenting experimental data.

Investigators of meat producers' problems should not overlook the great importance of the quality and degree of marketable finish secured with various rations. To do this accurately animals must be appraised by market experts, who do their work carefully, whether at some live-stock market or at the experimental plant of the station. It should be borne in mind that the selling price of animals in market does not always indicate their market value. This should be determined independent of the sale price. Again, the experts should be checked by terminating the feeding experiment with a slaughter test, which should indicate whether or not the experts were right.

The Illinois station has adopted the plan of presenting tentative and incomplete data in circular form, using the bulletins for more formal and permanent presentations. A clear-cut distinction is made between results that are characteristic enough to be considered conclusive and those which are simply indicative.

Finally, the investigator can well afford to keep in mind that meat production is an economic question.

J. L. Hills, of Vermont, read the following paper:

METHODS OF EXPERIMENTATION IN FEEDING FOR MILK PRODUCTION.

Animal production is studied experimentally at present by means of the so-called practical feeding trial as well as through the use of the more refined apparatus and methods of exact measurement. The first-named scheme is really a study in economics; it has to do with results rather than with causes. The latter deals with physiological chemistry and is concerned more with the development of fundamentals than with the dollars-and-cents phase of the problem. Successfully to prosecute the one neither calls for a high degree of skill as to the plan or its conduct nor great acumen in interpretation of results; properly to accomplish the other necessitates in all these respects and more the utmost thought and attention. Each method has its strong and weak points; each its devotees and those who deride it. It has been the fashion of late to criticise unfavorably the so-called practical feeding test; to condemn it as unscientific; to say that it deals with effect and not with cause; that it does not differentiate between the products which are food-derived and those which form as a result of sundry katabolic activities; that, in short, it fails in its proper mission in that while the fact may be developed, no clew is afforded as to the method or reason back of the fact. It is also averred—often with all too much truth—that the plan is apt to be faulty in conception, execution, or scope; that sufficient allowance is not made for bovine idiosyncrasies; that data are infrequently or imperfectly gathered, inadequately digested, or erroneously interpreted; and, finally, that diametrically opposite results are often arrived at under apparently identical circumstances.

It is doubtless quite in order in view of our present-day knowledge to jettison the results attained in most of the earlier trials, not to speak of many of the later ones; but that it is wise or necessary to give up the ship, to acknowledge—to change the metaphor—in the language of the prayer book, that “there is no health in us,” I can not believe. The paramountcy of the physiological study is freely conceded. That a service of greater ultimate practical value is likely to be attained through the prosecution of such researches than is to be expected from the continued results of all the practical feeding experiments put together may be allowed. One can not help but doff his cap to the respiration calorimeter. Just as the discovery of radium has compelled the acceptance of new conceptions in the domains of chemistry and physics, so will the study of energy values necessitate a revision of our present notions as to the fundamentals of feeding practice. Doubtless the days of digestible dry matter and of nutritive ratios are numbered. They have served and are serving a good purpose, but in time seem likely to be relegated to the rear; in the language of the street, “not yet—but soon.” Pending the advent of that day there seems, to the writer at least, to be room still for the practical feeding trial as applied to dairy experimentation, notwithstanding the fugitive nature of the results, provided, of course, that it is adequately planned and its conduct properly safeguarded.

The writer has never had to do with a physiological study. It would be presumptuous on his part to attempt to outline methods of investigation of such a character; nor would he have been selected for such a task. Nor, indeed, does he now recall many feeding trials of this nature with milch cows. Doubtless others exist, but their numbers are probably comparatively few. It has fallen to his lot, however, to conduct relatively large numbers of trials of the baser sort and to have made attempts during the past decade looking toward their standardization, to which, with other matters naturally allied thereto, brief allusion may be made as a basis for discussion.

The consideration of a practical feeding trial prior to its inception naturally divides itself into three parts—the scheme, the animals, their environment. In connection with the scheme one naturally takes into account the selection of the experimental ration, especially the particular feed under survey; the method of comparison to be used, as, for example, whether the cows or the feed shall be alternated or whether a prolonged trial shall be instituted, as well as sundry details as to the chemical control of the trial; under the head of selection of animals, numbers, ages, stages of lactation, hereditary or inherent tendencies are all to be considered; while under the last head—environment—the season, in or out door life, the manner of feeding, milking, etc., need consideration. And, finally, when the trial is finished the method of presentation of results deserves careful attention.

The *scheme of experimentation*, if the trial is of the so-called practical type, naturally is designed to determine the relative milk, butter, or cheese making properties of a given fodder, feed, or ration. The outcome is naturally measured in terms of dairy product, of money product or both. Its successful conduct necessitates such a plan as will afford competitive rations an equal chance, or, in other words, such as will offer to the particular fodder or feed under survey an opportunity to prove its worth, which shall be in no way greater or less than that afforded to the standard with which it is compared.

The systems of measurement commonly used are four in number:

(1) Competitive rations are fed to the same cows in successive periods in alternation: Ration A, followed by Ration B, which in turn is followed by Ration A. This constitutes the simple alternation system.

(2) Competitive rations are fed to two groups of cows continuously. Ration A to Group X and Ration B to Group Y. This constitutes the continuous system.

(3) The available animals are divided into three groups as nearly as may be identical in make-up and in probable capacity for production. To one group the standard ration is fed continuously, to another the experimental ration continuously, while to the third group are fed these rations in alternation. The groups being supposedly so constituted as to be capable of making an essentially similar production for a term of several months if similarly fed and treated, it is assumed that such differences in yield as are actually observed when divergencies do occur coincident with changes in the ration are fair measures of food values. This constitutes the combined continuous and alternating system.

(4) Competitive rations are fed to two groups of cows for an indefinite length of time, comprising one, two, or more entire lactations. This scheme has not, so far as the writer knows, been named, but might well be dubbed the perpetual system.

The first and third systems have been under survey at the Vermont station for many years. While the feeding practice at that institution is in many respects justly open to criticism, it is strong in at least one point in that the large number of available animals permits much repetition and the acquirement of considerable data on a given point. The writer's judgment, based upon the study of six years' trials of these two systems of measurement, leads him to feel that if similar results are attained with each the likelihood of their essential accuracy is fortified by the dissimilarity of the schemes employed. It further impels him to believe that ordinarily when the outcomes attained by the two methods are more or less unlike, that derived by the use of the alternation system is likely to be the more trustworthy. Indeed, if but a relatively limited number of animals are available for use the method of alternation is much more likely to yield trustworthy results. However, in every case a careful interpretation of the results needs to be made.

This statement, however, needs qualification. One seeks in trials of this character results which bid fair to indicate permanent effects rather than those

of a merely temporary character. It has been abundantly proven that data obtained when feeding periods are but two or three weeks long are not truly indicative; that, indeed, four-week periods are not long enough in many cases. Yet, if one employs the alternation system and extends the period length to seven or eight weeks and uses pregnant cows, the changes in lactation due to this condition are apt to introduce as serious an error as does the inordinate shortening of the feeding period. The writer's personal judgment, based on two years' comparative trials of the alternation system with a large number of cows in which similar rations were fed in periods ranging from three to eight weeks in length, leads him to favor a feeding period five or six weeks long as being most likely to avoid both Scylla and Charybdis.

But there have arisen of late years grave doubts as to the validity of data secured by the alternation system, regardless of the length of the feeding period, doubts engendered largely by results attained with cows uniformly fed for several lactations. Babcock's unsalted cows and Hecker's low protein eaters, maintaining apparent normality of condition and of milk flow for months, and in some cases for years, before such a state of lowered vitality occurred as presaged a breakdown, are a challenge to the alternators. It is understood, moreover, that data obtained by the last-named investigator, as yet unpublished, seem likely to cause him to modify views hitherto published, this changed attitude being due to results obtained during a yet longer feeding experience with the same cows continuously and similarly fed for a long series of years. And yet the views he has heretofore enunciated were based on feeding trials which lasted for several lactations. Well may Thorne pessimistically remark that "we need to extend the ninety-day test into a twelve-month test, and the twelvemonth test must grow into observations extending over the entire lifetime of a very large number of individuals before perfection in this work is attained." And we may all agree with him when he further says that "we might as well drop the three or four week test altogether." It is extremely doubtful if the data afforded by the relatively short feeding period ordinarily employed and discussed above—even the six-week period—are sufficient to afford an accurate measure of the physiological effect of a given nutrient or food. Babcock says on this point that "it seems likely * * * that there are certain reserve forces which enables an animal to adapt itself to adverse conditions and even to overcome the effect of malnutrition for much longer periods than have heretofore been considered sufficient," and that "much additional knowledge concerning the physiological influence of foods may be gained, and thereby many of the uncertainties which exist to-day regarding feeding problems be eliminated, by greatly extending the experimental periods."

While there is much truth in this general contention, such extreme prolongation of a feeding trial introduces another serious error. There are cows and cows. The performances of apparently similar individuals under identical conditions of feed, environment, etc., are apt to be so unlike as to make such attempts to measure food values difficult of execution and the accuracy of the outcome often problematical. In short, under conditions of continuous feeding, whether lasting fifteen weeks, fifteen months, or thrice that time, questions arise as to the equality of the individuals and the groups which make for confusion. He who can, from an often limited number of animals, formulate groups which for a great length of time will prove essentially equivalent in their milk-making powers is gifted with second sight. In short, the writer, while willing to admit that the advocate of feeding experimentation of the prolonged type has in some respects much the best of the argument—indeed, irrefutable arguments—contends that there is some glass about his edifice and that he should be chary with his brickbats.

Whatever system of measurement is used it is desirable to maintain as close a chemical control as is practicable. A few analyses of samples of milk taken at odd intervals, even though made by careful gravimetric methods, seem less likely to be truly representative than will constant sampling and the frequent analyses of composites by the Babcock and the lactometer, checked occasionally, perhaps, by gravimetric work. If the number of animals under observation is small enough the preparation of roughages in advance is desirable. If too large to admit of this precaution, frequent—say, weekly or biweekly—samples of all roughages and concentrates enables one to keep a fairly close control over food income.

Selection of animals—Numbers.—In numbers there is strength. The error of the personal equation is thus minimized. Not less than six to a trial, and

"the more the merrier," should be used, so permuted by double alternation. If that method is employed as regards scheme and feeding, as to lessen the effect upon the final outcome of weather and other changes. For a decade records of cows at the Vermont station, uniformly fed for a long series of months, have been so calculated by the alternation system as to afford testimony as to the extent of the experimental error. With individual cows it has frequently been considerable, but when four or more have been gathered together it has been invariably proven to have been an almost negligible quantity. The writer is inclined to believe that the results obtained with considerable numbers of animals, even when the refinements of care are not used in the conduct of the trial, are likely to afford more nearly correct results than those derived from the use of but a small number handled with extreme precaution.

Age.—A relatively immaterial factor, provided that heifers and aged cows are distributed through the trials in such manner as to offset.

Stage of lactation.—Were it not for the shrinkage in lactation, trials of this character would be more easily planned and executed and results would be more certain. It does not seem advisable to use new milch cows only. The practical feeder has to feed all sorts—new milch and strippers. Those in mid-lactation, on the whole, are to be preferred to those fresh in milk as more likely to give an even flow under similar conditions. This point was well brought out by Beach, who shows that from month to month the shrinkage is greater during the first three months and the last two in a ten-month lactation than during the intermediate five months. In this respect a September calving cow is in ideal condition in northern latitudes for alternation trials. If cows are used which are likely to arrive at or near the stripping stage toward the end of the trial, they should be so distributed through the trials as to do little harm should their records prove inadequate.

Hereditary or inherent tendencies.—Few matters in connection with the formulation of the scheme for a feeding trial are more essential than a close acquaintance with the animals to be used and a careful preliminary study of their present condition and previous history. It is always an unsatisfactory proposition to make use of a cow in feeding trials concerning whose idiosyncrasies one is ignorant. It has been the writer's custom in the preliminary planning of feeding trials carefully to study not only the condition of each animal at the moment, but thoroughly to review her past history, if she had one; to spend days in the study of accumulated and tabulated data prior to the selection and grouping of the various animals for the coming trials. From 40 to 50 cows have yearly taken part in these trials. To have pitted certain cows against certain others would have been to have invited an unsatisfactory outcome.

Selection of feed.—It is not a difficult thing simply to pick out a fodder or feed for experimental purposes. One may make a comparative study of this, that, or the other without difficulty, so far as choice is concerned. When, however, the trial material is supplemented, as it should be, with other fodders and feeds to form an acceptable ration, the matter becomes complicated. One always feels on this account some measure of doubt as to the validity of the results attained with these studies; and yet—particularly if the material under survey is a concentrate—nothing else can be done.

Environment.—The changes wrought by the seasonal environment of the animals are profound. Barn life in northern New England in January and in May are very unlike, and this dissimilarity may well be a disturbing factor. The stable, its ventilation, its light, its arrangement, doubtless have effect. The manner in which the animals are fed, the care which is taken by the barn hands to make weights down to the last decimal, the completeness of milking—a most important factor—the possibility of error of observation, or ignorance, of carelessness, of intent; in short, the human personal equation, all have to be reckoned with. Yet here again, in the writer's judgment, safety lies in numbers. If a large number of animals is used; if every day each experimental ration is fed to some of the trial cows; if they crisscross in the shifts from one ration to another; or, in other words, a system of double alternation be employed, the irregularities introduced by environmental conditions are apt to be minimized. For nearly twenty years a careful temperature record of the Vermont feeding barn has been kept during experimental feeding. Many attempts have been made to trace connection between extreme cold, for instance, and the

milk flow. While minor changes have been observed, the crisscross above referred to has served to nullify the effect upon the final result. How to lessen the error introduced by the personal equation is a local question, often most difficult of solution. I have no ready remedy for it, and am eager to find one.

Repetition and cooperation.—If the results attained by dairy experimentation of any of these sorts have value, that value is enhanced by a repetition of trials at different times and at different places. It has been the writer's custom to repeat feeding trials during two or more years. It seems certain, moreover, that if an essential consensus of judgment as to the details of feeding-trial methods be arrived at, yet greater value would result from repetition at different points.

Presentation of results.—Personally the writer favors a very full presentation of data, appendixed so far as possible, the essentials only to be included in the text. He likewise favors the minimizing of explanatory matter and condensation to the last degree practicable, provided that clearness and accuracy of the statements be not lost. The story of a feeding trial is less interesting reading than is Mr. Dooley's philosophy and words should not be wasted in telling it; yet it is doubtless true that he who fears diffuseness is apt to fall into the error of overconciseness. It is a good plan to do team work in the matter of presentation of results and to seek the advice of one's colleagues in other lines. If our botanist fails readily to grasp the meaning of a statement made by the chemist, or vice versa, the assumption is that the lay reader will likewise be befogged, and the statement has to be clarified. The nature of the trial, as well as the audience to which it appeals, naturally influences the method of presentation.

H. P. ARMSBY, of Pennsylvania. I would like to ask the speaker if in his feeding work he has made any attempt to study or measure what might be called the residual effect of a given ration.

J. L. HILLS. No specific study of that kind has been made. Our practice has been to divide the five-week feeding period into preliminary and experimental portions, and utterly to disregard the results obtained during the first twelve days. I have frequently observed, however, several of these residual effects, particularly as they affect the quality of the milk. Whether these residual effects would entirely pass away in twelve days is doubtful.

A DELEGATE. I know something of the residual effects as they exist in the cow. It may be observable for several months; in fact, the results are observable for months afterwards. The ordinary preliminary feeding will not eliminate their effect upon the result.

EVENING SESSION, THURSDAY, NOVEMBER 15, 1906.

The section was called to order at 8.30 p. m. by the chairman, B. C. Buffum.

ELECTION OF OFFICERS OF THE SECTION AND MEMBERS OF THE EXECUTIVE COMMITTEE.

L. G. Carpenter, of Colorado, presented the following report for the committee on nominations:

Your committee on nominations for the section of experiment station work would respectfully recommend as officers for the coming year: For committee on programme, H. J. Waters, of Missouri; H. T. French, of Idaho, and C. E. Thorne, of Ohio; for chairman of the section, M. A. Scovell, of Kentucky; for secretary, C. E. Thorne, of Ohio; for members of the executive committee, W. H. Jordan, of New York, and C. F. Curtiss, of Iowa.

The officers named were duly elected.

H. P. Armsby, of Pennsylvania, presented the following paper:

Farm animals are kept substantially for two purposes—for the production of work and for the production of human food.

As regards work production, while it is true that horses and other work animals are being to a greater or less extent replaced by other prime motors, such as steam, gasoline, and alcohol engines, and the electric motor, such replacement has not yet become possible on the small farm or for anything like all the purposes for which work animals are kept. The production of work is still, and is likely to continue to be, an important branch of animal husbandry.

The Twelfth Census gives the number of horses and mules over 2 years old in the United States as, in round numbers, eighteen and one-fourth million, worth one thousand million dollars. Estimating that these animals work, on the average, only four hours per day and generate three-fourths of a nominal horsepower each, we have the equivalent of the continuous production, night and day, of over two and one-fourth million horsepower, or nearly one-third the total estimated horsepower of Niagara Falls, and many times what is actually utilized.

Notwithstanding the importance of the animal as a prime motor, however, it is as a source of human food that he finds his principal place in American agriculture.

It is estimated by competent authority that over 45 per cent of the food consumption of the better classes in the United States consists of animal and dairy products. Taking into account the relatively higher prices of these materials, it seems safe to estimate that considerable more than half of the expenditure of the average family for food goes for this class of materials. Moreover, whatever, in the light of recent discussion, may be our attitude toward vegetarianism, or our judgment as to the necessary proteid supply, it is certainly a fact, however we may explain it, that those peoples are as a whole most efficient which consume a reasonable proportion of animal food.

There were killed in the wholesale slaughtering and packing houses of the United States, in 1900, 5,500,000 cattle, 9,000,000 sheep, and 30,500,000 swine, or a total of 45,000,000 animals, estimated to be worth \$683,000,000. The value of animals slaughtered on farms was estimated at \$190,000,000, making a total value of \$873,000,000. Adding to this the value of our dairy products, about \$433,000,000, and that of the poultry and egg production, about \$282,000,000, we have a total of about \$1,588,000,000 for the yearly value of the output of animal foods.

For both of the purposes just named, the animal utilizes the energy originally derived from solar radiation and stored up in vegetable products by the synthetic action of the chlorophyll. The point of economic importance in this connection is that these enormous aggregates of value represent to a considerable extent a utilization of the potential energy of inedible products, which would otherwise be a waste so far as food value is concerned, and largely so as a source of power. This is true on the one hand of the leaves, stems, husks, pods, etc., of our various farm crops—the so-called coarse fodders—and on the other, of those manufacturing by-products which accumulate in the preparation of grains and other raw materials for human consumption. By feeding these products to our domestic animals we utilize for feeding man or performing his work a portion of their stored-up energy, which would otherwise be practically an entire waste. Of course, surplus edible products are also utilized in stock feeding and in this country very largely so. This, however, can only be regarded as a temporary phase of our agriculture. While, on the fertile soil of the corn belt, it is often found more profitable to convert corn into beef or pork than to market it directly, as the density of population and the demand for breadstuffs increases, the stock feeder will be more and more constrained to the use of the cheaper by-product feeds in place of grain. From the economic point of view, then, it is highly important that that portion of our national wealth represented by these inedible products should be utilized to the best advantage, yielding a greater aggregate profit to the producer and a more liberal supply of animal food to the consumer.

Time prevents more than a mere reference to the important relations which subsist between animal husbandry and the preservation of soil fertility. While we no longer regard the farm animal as a mere manure machine, still the maintenance of the fertility of the farm is an important element in determining the

^a See also Experiment Station Record, 18, p. 508.

profits of stock raising, and from this point of view, as well as from that of the more complete utilization of solar energy, these forms of agriculture are to be preferred, other things being equal, which maintain a due balance between the production of crops and of animals.

From all points of view, then, animal husbandry is a most important factor in our agriculture. Into the many exceedingly interesting and important questions regarding the breeding of farm animals, I shall not enter at this time, both from lack of time and lack of qualification. The other half of the subject, however, that of the economic feeding of these animals, is certainly of at least equal importance with that of their breeding.

The experiment stations of the United States have not failed to recognize the importance of this branch of agriculture. The station literature of the last twenty years presents an imposing array of bulletins and articles treating of all phases of stock feeding. From a cursory survey we should be led to suppose that our knowledge of the subject was making rapid advances. A closer examination, however, will cause some modification of this first impression. In a paper read before the Graduate Summer School of Agriculture last July, Director Jordan presented a classified list of the subjects of the bulletins upon stock feeding issued by the stations for the years 1903, 1904, and 1905, which shows some rather startling facts. Out of a total of 84 bulletins, 43 were reports upon comparative tests of either single feeds or individual rations. This form of feeding experiment has been almost as great a favorite as its analogue, the variety test, and the results have scarcely been more profitable in the one case than in the other. A reasonably diligent compiler could readily accumulate a great volume of data derived from such comparisons, but I think it very doubtful whether the results reached would be worth the labor. I venture to question whether stock feeders in general have derived very much real permanent profit from this class of experimental work.

Next most numerous on Jordan's list are the experiments, 7 in number, upon the adaptability of certain feeds to special animals or purposes, a work most useful with new feeds, and yet a work scarcely demanding more appliances or attention than could be given it by a good practical feeder. Following these come, in equal numbers, experiments upon the substitution of home-grown for commercial feeds, and determinations of digestibility, both classes represented by 5 bulletins. The class first named—substitution experiments—are of undoubted economic value, but are necessarily of more or less local applicability. As regards digestion experiments, I shall have occasion to speak later.

Not to prolong this enumeration, I think it is not doing injustice to the American stations, whether we judge by the record of these three years or by our general knowledge of their work, to say that while their investigations have brought to light or demonstrated to the farmer many useful facts, local or otherwise, they have served only to a very subordinate degree to reveal principles. The latter we have seemed largely content to borrow from foreign investigators. To say this is not to deny the great value of much of the work done by our stations, nor to decry the publication of useful information. Nevertheless, the experiment stations stand before the country as the representatives of agricultural science, manned or presumed to be manned by scientific men. As scientific men we should know and should proclaim that permanent progress in agriculture is possible only through the establishment of principles. One principle well founded is worth a thousand facts, because it includes them all. I can not avoid suspecting that the principles which have been borrowed from foreign investigators and popularized by station literature and in other ways have done quite as much to help the practical feeder as our own experiments.

But how do matters stand with our borrowed science of feeding? Will it stand the strain we are putting on it?

The methods of comparing the values of feeds and rations which still largely prevail, date back almost fifty years to the fundamental investigations of Henneberg and Stohmann at the Weende Experiment Station, in Saxony, begun in 1858 and published in 1860 and subsequent years. Our methods for the analysis of feeding stuffs, the technic of digestion experiments, and the interpretation of their results, are all, in the main, what were formulated by these investigators. They grouped the digestible organic matters of feeding stuffs into protein, fat, and carbohydrates, the latter including the digestible portion of the "crude fiber" and of the "nitrogen free extract," and the values of feeds were estimated on the basis of the amounts of these nutrients which they could supply.

Henneberg and Stohmann, however, were fully aware of the fact that such investigation into the content of feeding stuffs constituted but one-half of the

problem, and that it was just as necessary to determine with equal exactness the real nutritive effect produced by their use. In 1870, in an introduction to a third report upon their work, Henneberg discussed very fully the methods by which this nutritive effect could be determined, with the aid of the respiration apparatus, on the basis of his familiar conception of the schematic body. Not only this, but he formulated a programme of systematic investigations and made a beginning in its execution.

The determination of the digestibility of the nutrients in feeding stuffs, however, could be much more easily and cheaply accomplished than the actual determination of their nutritive value according to Henneberg's programme. The assumption of the equal value of protein, carbohydrates, and fat from different sources having been once made, it was perhaps not surprising that the average experimenter should accept this assumption and follow the easier path. Almost innumerable digestion experiments have been made during the last forty-five years, on the basis of which tables have been prepared which give us a very good general idea of the average composition and digestibility of feeding stuffs and of the extent of their variations. Somewhat later so-called "feeding standards" were propounded in which it was attempted to formulate the amounts of the several nutrients best adapted to the various purposes of production. The general acceptance of this point of view was largely brought about by the writings of Wolff. The whole made a complete and simple system. So much is required for a certain purpose. This feed will furnish so much and the other so much. It is simply a question of arithmetic to work out a suitable combination, and a machine has even been devised for this purpose.

This system was introduced to the American public after it had assumed quite a definite form, and it may fairly be said to be still, to a considerable extent, the basis of our theory. We question some of the standards—some of them we have modified—we hold them more flexibly than we once did—but protein, carbohydrates, and fat are still the feeding trinity. Our theory of nutrition has become traditional, and has little pedagogic value for the student and little inspiration for the investigator. As a natural result it is more or less out of touch with practice, while our experiments upon the theoretical side of the subject have been marking time.

With the publication of the results obtained by Zuntz and his associates upon the work of digestion, and of Kühn's and Kellner's respiration experiments at Moeckern, a new stage of progress was entered upon, to which I venture to hope that our own station in Pennsylvania has contributed a little. While the results of these investigations are best and most conveniently expressed in terms of energy, that is not the essential point. The vital thing is that in these experiments the amount of production due to each material experimented upon has been actually determined with at least a fair degree of accuracy, by the laborious methods of the respiration apparatus or the respiration calorimeter. Enough results have already accumulated to show that many of the old values assigned to feeding stuffs vary widely from the truth. In particular these investigations have demonstrated the inaccuracy of the fundamental assumption upon which we have been basing our comparisons of feeding stuffs, viz, that digestible matter from different sources is equally valuable. For example, an experiment at the Pennsylvania station showed the digestible organic matter of corn meal to be 21 per cent more efficient for maintaining a steer than the same amount of digestible matter from timothy hay, and 56 per cent more efficient for fattening. Kellner estimates the value of the digestible matter in numerous coarse feeds at only 20 to 30 per cent of that of the digestible matter of grains, while Zuntz actually computes a negative result for the nutritive value of straw for the horse.

In the face of such differences as these, with what justification can we calmly continue to publish the old figures for digestible nutrients and to teach our students the conventional computation of rations?

Nor does it better matters much to add to our tables figures for the so-called "fuel values" of feeding stuffs.

In the first place, the figures commonly given are incorrect. They are based in most cases on Rubner's or Atwater's factors for human dietaries, and while these factors have been shown to be substantially accurate for the purpose for which they were intended, they have also been shown to be grossly inaccurate when applied to the digestible nutrients of stock feeds, the results being too high, in some cases by as much as 25 per cent.

In the second place, even if these energy values were correct, they do not help us much. We can not rejuvenate the old tables in this way. The writer is fully convinced of the advantages for many purposes of regarding nutrition problems from the standpoint of energetics, but it needs to be emphasized that the advantage of the calorie over the pound is simply as a measure. It is a better measuring stick than the pound, with a wider range of uses, but it is still a measuring stick, an implement, and the value of the results depend on what and how we measure. The prime failure of Henneberg's successors was not in the units which they used, but that they failed to measure the real nutritive effect of their feeds and rations, and we but repeat their failure when we seek to make progress by substituting these energy values for the equivalent amounts of matter. It is doubtless very desirable to know the amounts of digestible matter in feeding stuffs, and the corresponding quantities of energy, more accurately than we do at present, but neither the one nor the other by itself gives us any definite information as to the use made by the organism of the matter or energy supplied in the feed. It is only as we determine by the use of the respiration apparatus or calorimeter (or possibly by the comparative slaughter test) the actual changes brought about by the feed in the store of matter or of potential energy contained in the body that we can reach a scientifically accurate determination of the nutritive value of that feed. Unless we do this, no matter how accurately we may analyze the feeding stuffs supplied or determine their energy, the second member of the equation is lacking. We stand in urgent need of actual determinations by modern methods, of the nutritive values of feeding stuffs for different purposes, the results of which we may substitute for the assumptions on which we are now basing our teachings.

I may instance in particular the importance of determinations of the maintenance values of feeding stuffs, in which a beginning has been made by the Pennsylvania station. The results thus far reached hardly do more than show the need for further investigation. The experiments should be repeated with additional animals and extended to cover at least typical members of the different classes of feeding stuffs. Several years' work might profitably be expended on this single branch of the subject. Were this done, we might fairly hope, I think, to secure approximate factors which could be applied to those feeds whose maintenance values had not been directly determined. If successful, we should secure an indispensable factor for the discussion of the results of productive feeding, since it is evident that we must know how much of our ration has served simply for maintenance before we can rationally consider its productive value.

As regards the production values of feeding stuffs, we are better off, in that we have the results of Kellner's elaborate and exceedingly valuable determinations. For the feeding of mature fattening cattle it seems probable that the "production values" thus worked out may be regarded as at least a very close approximation to the truth. Here again, however, it is to be feared that we are in danger of repeating the mistakes of Henneberg's successors. Kellner has published quite a complete table of actual or computed production values. It would not be surprising if there should develop a tendency to accept these values as measuring the worth of feeding stuffs for all productive purposes. In other words, there is danger that we may rest in an assumption instead of actually determining the facts for ourselves. The results of our Pennsylvania experiments certainly indicate that the values for maintenance are higher than those for production. It would not be at all surprising if the production values for different purposes, or for different classes of animals, should prove to be materially different. At any rate, we have no warrant in advance of investigation for assuming that they are identical. We need similar determinations, by equally rigorous methods, of the productive values for other purposes. Here, again, we have a vast field open to the qualified and patient investigator equipped with the necessary appliances.

It may be objected that investigations such as those just outlined are to a degree empirical. They treat a single feeding stuff as an entity, while as a matter of fact it is not. We can determine the net available energy of a given sample of timothy hay, but we can hardly be said to determine the available energy of timothy hay. The justification for making such determinations lies in the fact that they promise to yield approximately correct and useful results within a reasonable time. Too great emphasis can hardly be laid upon the

importance of studies of the physiological values of individual chemical ingredients. Such results when once established are definite, because they refer to a definite substance; but on the other hand, it will be a long time before sufficient results of this sort are accumulated to furnish a sufficient basis for a science of feeding.

Finally, mention at least should be made of the importance of research upon the influence of condiments; that is, of the various flavoring and aromatic substances contained in feeding stuffs—what the Germans call *Reizstoffe*, which might be translated stimulants were it not for the unfortunate connotation of that word. We know that these substances exert an important influence upon the nutritive processes in the animal, but beyond this our knowledge is vague and qualitative.

The lines of investigation thus far suggested have to do with the relative values of feeding stuffs. The general applicability of any such results, however, has been questioned because of varying individuality in animals. That such variations, and striking ones, do exist is undeniable. It is not difficult, however, to suggest plausible explanations for them other than differences in the physiological utilization of the nutrients digested. For example, if of two animals one has a maintenance requirement 5 per cent greater than the other, due perhaps to greater restlessness of disposition, the quieter animal will do better than the more restless one upon a given ration, not because it uses its food physiologically to better advantage, but simply because it has more left for productive purposes after meeting the needs of maintenance. So, too, if of two animals otherwise identical, one is able to consume continuously 10 per cent more food than the other, it is obvious that a correspondingly larger proportion of its food is available for productive purposes, since the same amount must be subtracted for maintenance in both cases. I instance these simply as possible explanations, without intending to assert that they or similar ones are sufficient to account for all the observed difference. The point is that the question is one needing investigation.

In the first place the maintenance requirements of different species of animals and their variation, both as to proteids and total food, should be more fully investigated. At the present time only the data for cattle can be regarded as fairly satisfactory. Such results are indispensable for the rational study of the results of practical feeding experiments. The influence of such factors as breed, individuality, weight, and condition on the maintenance requirement should be examined, as well as such external factors as the influence of the surrounding temperature and of the greater or less incidental activity of the animal.

By careful methods much valuable information regarding the actual maintenance requirement of animals may be gathered by a combination of live weight and digestion experiments. When, however, we come to ask whether the maintenance value of a given feeding stuff, or in other words the net availability of its energy, varies with the animal to which it is fed, the aid of the respiration apparatus or calorimeter is indispensable.

We need also experiments upon the food requirements for production of various sorts. I can pause only to indicate a few of the problems under this head.

First, we have the proteid requirement. The question of the minimum proteid requirement has been brought to the fore by the investigations of Chittenden and others upon human nutrition. Since protein is usually the most expensive ingredient of rations, we need determinations of the actual amounts required, for instance, for growth at different ages. It would be interesting to determine whether there are individual differences in the rate of growth of proteid tissue, and whether this rate of growth can be stimulated by an excess of proteids in the ration. Similarly, for milk production, we attribute a stimulating effect to the proteid supply in excess of that appearing in the milk and excreta, but have we any real demonstration of such a fact? In the case of our working animals we know that the work is done largely at the immediate expense of the nonnitrogenous nutrients; but have the proteids no function in the matter, and is the universal practice of athletes, for example, to consume large amounts of proteid food a mere habit or tradition, and of no significance to us in the feeding of work animals? Questions such as those last indicated can, of course, be studied from the standpoint of the nitrogen balance of the body, but the history of investigations upon work production makes it evident that a comprehensive study of the subject requires also a study of the total

metabolism, and this again necessitates the use of the respiration apparatus or calorimeter.

Variations in the total food demand due to individuality, age, weight, condition, and the like, appeal for solution, and that solution can be reached only by accurate scientific methods. Similarly, in milk production the question of the factors influencing the distribution of the food between milk and tissue production needs thorough investigation. Again, the influence of such factors as temperature, water consumption, exposure to storms, humidity of the air, and the like need be only mentioned to show the need for further systematic investigation.

Finally, a mere mention of the influence of feed upon the quality of the product must serve to simply hint at a most fertile field of investigation.

But because I have thus far dwelt almost exclusively upon the scientific and almost recondite aspects of the study of feeding, I would not be thought to hold that this is the only kind of work that ought to be undertaken, or that no one should venture upon the field with any less formidable equipment than a digestion stall and an Atwater bomb, not to say the heavy artillery of respiration apparatus and calorimeter. The sling may still prove a formidable weapon, if wielded by the hand of a David, and the smooth pebble from the brook may still do its wonted execution. It is largely a question of aim.

The discovery and establishment of natural principles and laws requires the rigorous methods of physical and chemical research. By this path alone can we hope to attain a clear and definite quantitative conception of the processes of nutrition. But this alone is no more sufficient than the practical feeding experiment. We are dealing with an applied science, and our task is only half completed when we have established the fundamental principles of nutrition. We are under an equal obligation to show how these principles apply to the practical problems of feeding, and for this purpose nothing can take the place of actual experiments under the conditions of practice. If our practical experiments in the past have not been fruitful of general results it is not because they have been practical, but rather because they have not been so in the best sense. In too many cases they have lacked aim. They have not been informed by that comprehensive view of the whole subject which constitutes the essence of science and so, addressing themselves to petty temporary or local questions, have, while admirable in their technical detail, failed to materially advance our knowledge. The more thorough and exhaustive our scientific studies of nutrition become the greater will be our need for correlated practical experiments, scientifically planned to answer definite questions regarding the application in practice of the principles worked out in the laboratory or the respiration apparatus.

While this paper was in course of preparation I received from one of the leading investigators in animal husbandry in this country a letter containing a number of inquiries regarding certain points in animal nutrition. If designed to reveal my limited knowledge of the subject the letter was an unqualified success. To nearly all the inquiries I was compelled to return either conjectures or a simple "I don't know." I was, however, greatly interested in the letter from two points of view. In the first place, it illustrates the possibility of which I have just been speaking, namely, securing results of general value from practical experiments. The investigations which this gentleman has been carrying on have related primarily to questions of practice, yet he has been able to plan his experiments and study his results so as to give them an important bearing upon certain questions regarding the principles of nutrition. In the second place, the letter illustrates the inadequacy of the practical experiment alone and the necessity for scientific investigation along parallel lines. His experiments and experience raised questions which could not possibly be answered by such experiments, and yet they were questions which he, as a practical man, found of importance. His results would be of very great value in confirming or checking the conclusions from scientific investigations, yet, taken by themselves, they were indecisive and capable of more than one interpretation.

Systematic studies of the practice of successful feeders should aid largely in this phase of the work. We might, I believe, find an important field for similar investigation in the feeding experiments recorded in the bulletins and reports of the stations. These experiments have been conducted and reported with far greater care than are or can be the operations of the practical feeder. Doubtless a wise criticism would have to be exercised in their selection and dis-

cussion, but they constitute an almost unworked mine of valuable material. To cite a single personal illustration: The writer has somewhat recently undertaken a comparison of a few of the more readily available station experiments upon the fattening of cattle with reference to the proteid requirements of such animals. The results need not be quoted here; it is sufficient to say that they showed a strikingly good general agreement, and to that extent seem calculated to furnish a good guide for practice. Had it been possible to make a systematic search of station literature, doubtless the available data might have been largely increased, but such an undertaking is usually beyond the capacity of the individual investigator.

This last suggestion leads naturally to the consideration of a third line of activity, namely, the compilation and critical discussion of the literature of animal nutrition, so far as it is of value to the stock feeder. As a matter of course, such study and compilation would accompany the scientific investigations already suggested, but in addition there is a vast amount of recorded data, both American and foreign, available, out of which much valuable information might be dug which would serve to check and correct our conclusions from small-scale experiments. The work needs to be done, but its volume almost discourages one from making an individual beginning. In brief, we need, parallel with scientific investigation into principles, a comprehensive sifting, working over, and systematizing of the facts already on record.

I have thus endeavored, after pointing out the economic importance of the subject, to indicate the unsatisfactory nature of our present knowledge regarding the principles of stock feeding, and the need of broadly planned investigations in this field, and have ventured the attempt to outline in general terms some of the investigations needed. There still remains to be considered the administrative question of how systematic investigations of the sort needed can be most effectively promoted, and this again is part of the broader question of how far fundamental investigations into principles can legitimately and reasonably be expected from our institutions for agricultural research.

No simple and categorical answer is possible to this question. Diverse conditions and abilities must always be reckoned with. At the same time certain things may be suggested, with special reference to this particular subject, but of more or less general application. It may be remarked, in the first place, that in any such undertaking, whether along the lines suggested by this paper or relating to other subjects, there is need for a degree of coordination of effort. I am well aware that I am here treading on delicate ground, but without stirring up smoldering fires may we not freely and fully recognize the fact that while duplication of work, of which we have heard so much, far from being discouraged, should be encouraged, a certain common understanding of the broader features of the problem and of the most promising means of approach to it—to a degree, even a programme—is essential to satisfactory progress?

The fact is we have been carrying on a guerrilla warfare around the edges of the subject. Indeed, in pessimistic moments, I have sometimes feared that our stations and colleges have been quite as successful in capturing prizes at fat-stock shows as in developing the science of feeding or imparting pedagogic value to the subject. What we need is to plan a campaign against the unknown. Let me hasten to add, however, that this military metaphor, like all others, should not be made to "go on all fours." It does not necessarily imply military discipline or a commander in chief. What is important at the present time is that there should be some means of inspiring and promoting serious and systematic work in this field, guided by a broad view of the subject.

The writer hopes to be able to contribute something to the progress of science along this line and recognizes gratefully that circumstances have put greater opportunities at his disposal in some particulars than most of our investigators have hitherto enjoyed, but a few workers in a single institution seem like a forlorn hope when we contemplate the vast territory to be occupied. We need a dozen calorimeters instead of one. Above all, we need some means of guiding and to a degree coordinating the work of the younger men in our stations without depriving them of their initiative or of their individual credit for their investigations. Moreover, we need provision in some way for what may be called the drudgery of the work, for the computation of results, for the compilation of literature, and other work of the sort.

How this shall be accomplished I am far from undertaking to say. The stations as a rule, I think, appreciate the importance of the matter, but, as I took occasion to say recently in another connection, the pressure upon those in responsible charge of our experiment stations for results of immediate utility is such that it requires exceptional conviction and courage to set aside liberal

sums for pure scientific research. The United States Department of Agriculture has the advantage of a broader constituency, and to a certain degree, of larger freedom in its choice of subjects for investigation, yet it, too, perhaps even more than the stations, feels the pressure for popular approval. The problem is really one of educating our constituency.

It seems yet an open question how far it will prove possible for the experiment stations, with their pressing practical problems, to enter vigorously and aggressively into pure scientific research in the immediate future, either in this or other fields. The passage of the Adams Act has made this a live question, and it is most earnestly to be hoped that this fund will be used scrupulously in accordance with the spirit as well as the letter of the law and that the reflex influence of this will extend to expenditures under the Hatch Act as well. State problems should be studied at the expense of the State, and the national funds used for those broader investigations which are to benefit the whole country. It is to these funds and to those of the National Department of Agriculture that we must look for the promotion of comprehensive schemes of fundamental investigation whose results will become the common property of investigators everywhere.

I am inclined to see possibilities for larger service in this direction on the part of the United States Department of Agriculture than, I think, are some of my colleagues. Suppose, for example, that the Department were able to undertake a comprehensive scheme of investigation upon stock feeding corresponding to that which it is conducting so successfully in human nutrition. While the Department could hardly hope to find an Atwater to organize and direct the undertaking, yet with even a moderate degree of tact it surely ought to be able to attract the interest and confidence of the stations to its work, so that it would be to their manifest advantage to correlate their investigations with its own, whether officially or unofficially. For one, I can hardly doubt that such a course patiently adhered to, without effort for notoriety and depending on moral authority alone, would be a powerful influence in favor of unity of work and of the study of fundamental questions by scientific methods, as well as in training men in the methods of investigation. That the same methods might be applied to quite other lines of investigation is, of course, too obvious to require mention. Indeed, it is a phase of the vexed question of cooperation which seems to me well worth careful thought—the essence of the method, of course, lying in the personality of its executor.

After all is said, however, it may be questioned whether, in the present temper of the public mind, the more abstract forms of scientific research can be adequately maintained by institutions dependent entirely upon taxation for their support. The average taxpayer has come to have a considerable degree of confidence in scientific investigation, but he does not like long-term investments. He wants to see results, or at least the definite prospect of results, within a comparatively short time. This doubtless has its wholesome side as a discourager of dawdling and dilettanteism, but on the other hand the public has yet to learn that “the search for knowledge with exclusive reference to its practical application is generally unrewarded.”

I believe that the question of the permanent endowment of research in agricultural science, either in special institutions or in our great universities, is a subject well deserving the consideration of all interested in agricultural progress, and that an investment of this sort would yield richer returns of honor and satisfaction to the donor than many a memorial pile or stately library.

Nor are the amounts required large as compared with the magnitude of the interests involved. Thus, to take the single subject of this paper, a sum sufficient not only to equip, but to permanently endow, an institution for research in animal nutrition far superior to any now in existence anywhere would equal less than one-twentieth of 1 per cent of the value of our live stock and dairy products in a single year. Two cents per \$100 upon the average value of the live stock handled yearly at the Union Stock Yards for the last five years would amply equip such an institution, and a liberal revenue for its maintenance would amount to 1 cent per head upon the cattle alone slaughtered yearly in Chicago. But the endowment of research in agriculture is too large a subject to be entered upon at the close of a paper of this length, and I forbear to tax your patience further.

I am conscious of having spoken with a certain degree of personal bias in urging as I have done the importance of, and necessity for, fundamental investigations in a branch of science in which I am deeply interested. For this I

make no apology. If anything which I have said proves of service in promoting scientific investigation in any branch of agriculture, I shall feel amply justified.

W. H. JORDAN, of New York. The paper to which we have listened is certainly an able presentation of the subject which it treats. Two or three points have occurred to me on which I would like to comment briefly.

I trust that young men who would like to engage in investigations in animal nutrition will not feel that extensive and costly equipments are necessary for the study of nutrition problems. There is much that can be done without a respiration apparatus. With such an apparatus we arrive at knowledge that is very important, such as the balances of matter and energy under given conditions and the influence of various conditions upon metabolic processes, the use of energy, and so on. There are other important problems, however.

For instance, a digestion experiment is not as simple a matter as it was once supposed to be. The fact is we are even now practically unable to determine the real undigested residue. We can not separate this residue from metabolic waste products with any degree of accuracy. We have learned also that compounds which have been absorbed into the circulation are returned to the alimentary canal for excretion. We have right here, then, problems that should command the attention of the very best scientific ability for a period of years.

A study of the functions of nutrients offers a very attractive field. We know something of the general uses of what we call protein, carbohydrates, and fats, constructively, and as to other functions, but our knowledge is limited as to the difference in function of individual compounds. We have done a great deal of quantitative work in animal nutrition and have studied the influence of varying nutritive conditions upon production, and now we should give more attention to the relation of individual compounds to the physical status of the animal. Here is a field that may be made very fruitful of important results without the aid of an expensive apparatus, and I trust there are a few young men at least coming forward who will have enthusiasms along this line.

At the end of his paper Doctor Armsby referred to the attitude of the public toward long-continued investigations. I regard the situation as very hopeful in this respect. There is an intelligent minority among the agricultural public that has come to realize the supreme value of a study of fundamental truths. This is because the large practical results from certain severe and long-continued investigations along chemical and biological lines have become very evident. Intelligent farmers have come to see the foolishness of superficial work. I have faith that our constituencies will stand by us so long as they are convinced that we are earnestly seeking truth in the interests of agriculture and they will wait patiently until we are ready to announce our conclusions.

REPORT OF COMMITTEE ON UNIFICATION OF TERMS USED IN CHEMICAL ANALYSIS.

C. G. Hopkins, of Illinois, read the following report:

Your committee has been working in cooperation with a similar committee from the Association of Official Agricultural Chemists, and the following report is in harmony with a report already made to that association by its own committee, on which action was postponed for one year.

The subject-matter referred to your committee naturally divides itself into two classes, one of which includes soils, fertilizers, ash, and other materials whose analysis may be expressed in terms of chemical elements or in simple compounds; while the other class includes foodstuffs, condiments, and other materials whose analysis may best be expressed in terms of more complex compounds, or groups of compounds, which actually compose or are contained in the material.

SOILS, FERTILIZERS, ETC.

Special efforts have been made during the past two years to secure a full consideration, especially by directors of experiment stations, chemists, and agronomists, of the question whether it is better to continue to report analyses of soils and fertilizers on the basis of oxids (excepting nitrogen, which is already most commonly reported as the element), or to report such analyses on the uniform basis of the chemical elements.

Several circular letters have been sent out, and in answer to this question 85 replies have been received. Of these there were 21 making comments, but expressing no definite or final opinion on the question; there were 16, including 12 chemists, who favor retaining the present system; while there were 17 chemists, 16 agronomists, and 15 directors and other officers, or 48 in all, who expressed definite opinions in favor of adopting the uniform system of elements.

In view of these facts, and providing concurrent action is taken by the Association of Official Agricultural Chemists and the American Chemical Society, your committee favors the adoption of the element system for reporting analytical results in the analysis of soils, ashes, and fertilizers as rapidly as possible, and recommends that the association urge those responsible for fertilizer legislation to have the laws changed if necessary, and as soon as practicable to meet with these recommendations if concurred in.

This would necessitate the adoption of the dual system of expressing results temporarily in some States, but it is hoped that when fertilizer laws are adopted to meet these requirements some definite time will be set, at the expiration of which only the element system will appear on the bags or tags. It is therefore suggested that no other terms than those of the element system be allowed after the year 1916.

Your committee also recommends, provided the foregoing is adopted, that this association adopt some definite form for stating the composition of fertilizers and fertilizer materials. The following form is suggested:

Elements guaranteed:	Per cent.
Available nitrogen-----	
Inert nitrogen-----	
Available phosphorus-----	
Inert phosphorus-----	
Available potassium-----	
Inert potassium-----	

We recommend that the terms "available" and "inert" shall be used in harmony with the construction placed upon them by the Association of Official Agricultural Chemists.

The committee also recommends that in case of the adoption of the foregoing there be required to be printed on the bag or on the tag to be attached to the bag or to accompany fertilizers sold in bulk an explanatory statement naming the materials in which the plant food is carried, as, for example:

The plant food guaranteed in this fertilizer is carried in cotton-seed meal, potassium chlorid, and acid phosphate.

FOODSTUFFS, CONDIMENTS, ETC.

In the case of foodstuffs, condiments, etc., your committee recommends in the statement of analytical results the use of names of compounds actually present as such in the material, this being in accordance with the present general practice.

Your committee asks for further time in which to consider the more complete unification of systems for reporting results of analysis of some miscellaneous materials, as insecticides, baking powders, etc.

It is further recommended that this association appoint a committee to aid (preferably in cooperation with a similar committee from the Association of Official Agricultural Chemists) in trying to bring about both national and international uniformity in the reporting of analytical results.

CYRIL G. HOPKINS.

HARRY SNYDER.

H. J. WHEELER.

Committee.

In the discussion of this report attention was called to the importance of having its recommendations concurred in by the American Chemical Society and the Association of Official Agricultural Chemists.

C. G. HOPKINS called attention to the fact that the adoption of the recommendations provides that they shall be concurred in by the Association of Official Agricultural Chemists and the American Chemical Society, and explained that the matter had already been under consideration by the former association for some time. He also explained that there was some difference of opinion among the committee.

H. J. WHEELER, of Rhode Island, I think we should understand just what would be the result of the adoption of these recommendations. It would mean the changing of every fertilizer law in the Union, except possibly one, that of Illinois. I think it is practically impossible to get the States to change their laws, however desirable it may be. Now, if definite action is to be taken, it seems to me it ought to be taken with a full knowledge of what it means in the way of changes in the fertilizer law of the country. In some States it is extremely easy to change legislation, and in other States it is extremely difficult and dangerous to do it. I think that if in those States which use the most fertilizer any attempt were made to change the laws it would be very dangerous, and I don't think you could get them to attempt it. We must pass this proposition along first to the official chemists with a probability of it passing them, and then we will pass it to the American Chemical Society, and who is to say what sort of reception it will meet. Then we will have to deal with a great many other organizations in the country. It involves a great change in the practice of chemists, and it involves a great change in the farmer's understanding of matters as they now exist.

C. G. HOPKINS. Not more than 1 per cent of the farmers of the United States understand the use of the system we have now. There is necessarily some confusion on any new subject when we make any change whatever. Probably 1 per cent of the farmers of the United States would be confused for the next five or ten years, but the question is whether we shall cause this confusion or whether we shall continue a system which will be a cause of confusion for all centuries and for all our people.

The report was adopted and the committee continued.

Thereupon the section adjourned sine die.

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THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—

College Station: *Auburn*; J. F. Duggar.^a

Canebrake Station: *Uniontown*; J. M. Richeson.^b

Tuskegee Station: *Tuskegee*; G. W. Carver.^a

ALASKA—*Sitka*: C. C. Georgeson.^c

ARIZONA—*Tucson*: R. H. Forbes.^a

ARKANSAS—*Fayetteville*: W. G. Vincenheller.^a

CALIFORNIA—*Berkeley*: E. J. Wickson.^d

COLORADO—*Fort Collins*: L. G. Carpenter.^a

CONNECTICUT—

State Station: *New Haven*; E. H. Jenkins.^a

Storrs Station: *Storrs*; L. A. Clinton.^a

DELAWARE—*Newark*: Harry Hayward.^a

FLORIDA—*Gainesville*: P. H. Rolfs.^a

GEORGIA—*Experiment*: Martin V. Calvin.^a

HAWAII—

Federal Station: *Honolulu*; J. G. Smith.^c

Sugar Planters' Station: *Honolulu*; C. F. Eckart.^a

IDAHO—*Moscow*: H. T. French.^a

ILLINOIS—*Urbana*: E. Davenport.^a

INDIANA—*Lafayette*: A. Goss.^a

IOWA—*Ames*: C. F. Curtiss.^a

KANSAS—*Manhattan*: C. W. Burkett.^a

KENTUCKY—*Lexington*: M. A. Scovell.^a

LOUISIANA—

State Station: *Baton Rouge*;

Sugar Station: *Audubon Park, New Orleans*;

North Louisiana Station: *Calhoun*; W. R. Dodson.^a

MAINE—*Orono*: C. D. Woods.^a

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Fruit Station: *Mountain Grove*; P. Evans.^a

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PENNSYLVANIA—*State College*: H. P. Armsby.^a

PORTO RICO—*Mayaguez*: D. W. May.^c

RHODE ISLAND—*Kingston*: H. J. Wheeler.^a

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WYOMING—*Laramie*: B. C. Buffum.^a

^a Director.

^b Assistant director.

^c Special agent in charge.

^d Acting director.

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